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American Ferns—II. The Genus Phanerophlebia

BY LUCIEN MARCUS UNDERWOOD

(PLATES 359, 360)

During the past generation it has been customary for English and American botanists to refer to a single species, *Aspidium juglandifolium*, a long series of widely different ferns from Mexico, Central America and Venezuela. The original *Polypodium juglandifolium* was described from Caripe, Venezuela, by Humboldt, and his type is in the Willdenow herbarium. The relation of our own flora to this species commenced with the discovery of a plant on the Mexican Boundary Survey * which was referred to this species although it specifically resembles the type almost as little as it does *Polystichum acrostichoides* or any one of a half dozen species.

Several species have been separated from time to time by Schlectendal, by Martens and Galeotti, and later by Fournier. The latter in his list of the Ferns of Mexico † distinguishes five species but his knowledge of the typical form appears to have been somewhat at fault. Later still, Mr. Hemsley ‡ following Mr. Baker, unites all these divergent plants under a single species and the forty-three specimens at Kew are included under a single cover.

* Under the head of *Aspidium juglandifolium* in Eaton's Ferns of North America, we have the curious anomaly of a description of one species, a figure drawn from a second, details of venation from a third, and the name of a fourth given to the aggregation.

† Mexicanas Plantas, 1: 100. 1872.

‡ Biologia Centrali-Americana, 3: 642. 1885.

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The genus *Phanerophlebia* (Presl, Tent. Pteridogr. 84. 1836) was established by Presl together with the genus *Amblia* (Presl, Tent. Pteridogr. 184. 1836) the former founded on *P. nobilis* * and the latter on *P. juglandifolia*, the genera differing only in the supposed absence of indusia in the latter genus. It represents a somewhat natural group of plants of the Aspidieae with once pinnate leaves, coriaceous or herbaceous habit and 3–4-forked veins which in some species unite more or less copiously in the outer portions of the pinnae and in others remain free. In the species with normally free veins, however, accidental areolae sometimes appear. John Smith (in his later writings) and Moore united this genus with *Cyrtomium* whose type is the common *C. falcatum* of cultivation, but in that species and its allies a widely different type of venation occurs which in our judgment is sufficient for generic distinction. The relations of this genus to other generic groups which have been united under *Aspidium*, *Nephrodium*, and other names will be discussed later in this series of papers.

The genus *Phanerophlebia* has a limited distribution, ranging from the northern coast of South America to Arizona and New Mexico. There are at least eight species which may be easily separated as follows:

Veins regularly and copiously anastomosing.
- Pinnae 5–11, 4–5 cm. wide; inner line of sori near the midrib. 1. *P. juglandifolia.*
- Pinnae 16–20, 2–3 cm. or less wide; inner line of sori 3–5 mm. from the midrib. 3. *P. remotispora.*

Veins free or exceptionally anastomosing at rare intervals.
- Pinnae 3–5, cordate at base. 2. *P. pumila.*
- Pinnae 10–30, acute or obliquely obtuse at base.
  - Pinnae 7–15 cm. long, normally set at an angle of 50–75° with rachis.
    - Pinnae mostly auricled on the upper side of the base. 6. *P. auriculata.*
    - Pinnae obtuse or acute at base, not auricled.
      - Inner line of sori near the midrib; rachises smooth. 4. *P. nobilis.*
      - Inner line of sori 4 mm. from midrib; rachises scaly. 5. *P. umbonata.*

* While this genus is nominally founded on *P. nobilis*, the description and figure of the venation show a plant with anastomosing veins and it is more than probable that *P. remotispora*, a species not separated until over thirty years later, was the plant Presl had in hand. This point, which does not affect the establishment and validity of the genus, can probably be settled by an examination of Presl's plant at Prag.

Pinnae 18–20 cm. or more long; normally set at an angle of 30–40° with the rachis.
Sori in a single row with two others incomplete, 2.5 mm. in diameter.
7. *P. macrosora.*
Sori usually in four or less complete rows, small, 1.2 mm. wide.
8. *P. Guatemalensis.*

1. PHANEROPHLEBIA JUGLANDIFOLIA (H. & B.) J. Sm. Hook. Jour. Bot. **4**: 187. 1842.

Polypodium juglandifolium Humb. & Bonp.; Willd. Sp. Pl. **5**: 195. 1810.

Aspidium juglandifolium Kunze, Linnaea **20**: 363. 1847.

Cyrtomium juglandifolium Moore, Index Filicum, lxxxiii. 1857.

Amblya juglandifolia Presl. Tent. Pterid. 185. *pl. 7. f. 3.* 1836.

Rootstock short, ascending, with few scales: stipes slender, rarely with a few straggling scales, stramineous, 30–40 cm. long: pinnae 5–11 (mostly 7–9), 3–5 cm. apart, often with a tuft of tomentose scales in the axils, the terminal largest, 20×5 cm., the lowest smallest, 12×4.5 cm., often falcate; base obtuse; apex acute and often strongly acuminate; margin undulate below, becoming more and more distinctly serrulate toward the apex; texture subcoriaceous with a cartilaginous margin which extends into short rigid teeth, 0.5 mm. long; veins anastomosing throughout, the first row of areolae elongate, 1.5 cm., mostly with a free included veinlet which bears the first sorus about a millimeter from the base, the outer areolae smaller: sori 1.5 mm. across, the inner series 2 mm. from the midrib, the second series 5–7 mm. further out, a partial third series 2 mm. still farther removed from the midrib.

The type of this species is in Willdenow's collection at Berlin and is marked 434 Caripe,* Humboldt. This is almost exactly matched by a considerable number of specimens in various collections as follows:†

* Caripe, not always shown on the maps, is near the north coast of Venezuela, 28 kilometers S. S. E. from Cumana.

† In the citation of specimens it is desirable to indicate in what collections specimens have been examined, both to convey information as to where specimens of any given species can be consulted and because of variations existing under the same number of certain collectors. In this paper the herbaria are designated as follows:—B, Berlin;—C, Columbia;—D, Davenport (Massachusetts Horticultural Society);—E, D. C. Eaton, New Haven;—G, Gray, Cambridge;—K, Kew;—N, United States National Museum, Washington;—P, Philadelphia Academy of Sciences;—U, the writer's own collection.

VENEZUELA: Humboldt, 434 (B); Miguel, 20 (K); Buschel, (K, E); Funcke, 211 (K); Otto, 644 (K); Linden, 164 (K); Fendler, 233, in part (E, P).

[COLUMBIA: Andes Bogotenses, Triana.]

GUATEMALA: Salvin & Godman, 113 (G, K); J. Donnell Smith, 1051 (K); 768 (K, G, C, P).

MEXICO—*Chiapas:* Ghiesbreght, 414 (K, G, E).

The typical form of this species from Venezuela is well named *juglandifolium*, as the resemblance to walnut leaves is very striking. The Guatemalan specimens of Salvin and Godman are provided with slightly larger pinnae (terminal 20 × 6 cm., lower lateral 20 × 5 cm. scarcely falcate) and with more pronounced bristle teeth; the Mexican specimens have smaller pinnae, 12 × 2.5–3 cm., and also more pronounced bristle teeth. All agree in the basal and apical characters of the pinnae, venation, position of sori, the number of pinnae and the general habit.

Much is still to be desired regarding the rootstock. The Venezuelan specimens collected by Fendler and distributed under no. 233 are quite different from each other. That of Eaton's collection and the one in Short's herbarium at the Philadelphia Academy are nearly normal, but those of the Kew and Gray herbaria are younger, show more scaly rootstock, longer stipes with quite large dark-brown scales, and with a larger number of sori, the outer rows being more irregular, particularly in the specimen in Herb. Gray. A second species is clearly involved under this number.

The species is, however, very sharply circumscribed, its geographical limits are clearly marked, and it is not to be confused with the very distinct species found farther north.

2. PHANEROPHLEBIA PUMILA (Mart. & Galeotti) Fée, Gen. Filicum, 282. 1852.

Aspidium pumilum Martens & Galeotti, Mém. sur les Fougères du Mexique, 64. *pl. 17. f. 1.* 1844.

Aspidium juglandifolium D. C. Eaton, Ferns of North America, 2: *pl. 75. f. 5–8.*

Rootstock so far as known short and compact: stipes clustered, 5–11 cm. long, stramineous or brownish, densely scaly with nar-

row slender lanceolate scales: pinnae 1–5 (in one rare case 10), the terminal much the largest, 6–10 cm. long, 2.5–2.8 cm. wide, the lateral 3–3.5 cm. long, 2–2.5 wide, all cordate at the base, the terminal normally acute, the lateral mostly obtuse except for the terminal spine; margins with projecting spines 1 mm. long: sori in two usually complete rows with occasionally scattering outliers, the inner row 1–3 mm. from midrib, the second row 2–3 mm. farther out: veins free, 2–4 times forked, the sori borne mostly on the middle of the alternating branches.

MEXICO [*Oaxaca:* Galeotti, 6251]. *Chiapas:* Ghiesbreght (K, G, E, U); Linden, 1552 (K).

There appears to be considerable variation in the number of pinnae though the predominating number is 3 as seen by the following series examined:

Ghiesbreght (Hb. Eaton) 1, 2, 3, 3, 3, 3, 3, 3, 4; (Hb. Gray) 3, 5, 5, 10*; (Hb. Underwood) 2, 4; (Nat. Herb.) 5; (Hb. Kew) 3, 3, 3, 5, 5, 5, 5; Linden (Hb. Kew) 3, 3, 3, 3.

The relation of this species to *P. Lindeni* is not clear. Of the latter I have seen only the Kew specimen (Chiapas, Linden, 1551) which is represented by two leaves with the following measurements: terminal pinnae 14×3 cm., lateral 9×2.3 cm., the terminal remote (2.5–3 cm.) from the lateral, all the pinnae taper-pointed.† In one of the leaves there is an auriculate base on each lateral pinna. In Eaton's specimen of *P. pumila* there is a single leaf strikingly similar to Linden, 1551, but smaller and totally unlike any of the other specimens of the sheet. This leaf is disconnected from the other specimens, so may belong to a different plant from the rooted specimen; its dimensions are: stipe 17 cm., terminal 10×2.3 cm., lateral 6.5×1.7 cm. While there is no question that we have in *P. pumila* a species totally distinct from any other of the group, only field work will determine whether we do not also have two. In other words *P. Lindeni* may be a distinct species.

3. PHANEROPHLEBIA REMOTISPORA Fourn. Mex. Plantas **1**: 100. 1872.

Rootstock unknown: stipes 35–40 cm. long, stramineous,

*This leaf, which is separate from the other three which constitute the specimen, is also peculiar in showing broadly obtuse almost truncate bases to the lateral pinnae and an acute apex and with a falcate upper curve.

†It should be noticed that the pinnæ of Linden's 1552 are more acute than in hiesbreght's specimens.

with broad brownish scales on the lower fourth, naked above: leaf 35–40 cm. long, with 16–20 pinnae which are 10 cm. or more long, 1.5–2.8 cm. wide, unequally obtuse or slightly acute at base, the apex tapering, slightly falcate; margin prickly, the spines more or less appressed near the base, more spreading at the apex; terminal pinnae slightly larger: veins anastomosing, the first branch from each vein bearing a sorus above its middle, either ending as a free included veinlet or rarely uniting with some other vein: sori small, 1 mm. or less in diameter, in two or three rows, the innermost row 3–5 mm. from the midrib.

The type of this plant was collected in Orizaba by Bourgeau, 2349, and appears to extend from southeastern Mexico to Guatemala.

MEXICO—*Vera Cruz:* Orizaba, Bourgeau, 2349 (K, N, G, C, E), 2348 (C); Mohr, 87 (E); Müller, 729 (C); Witmer, 99 (P). Xalapa, Coulter, 1712 (K). Cordoba, Schaffner, 23 (K); Kerber, 69 (K). Mirador, Liebmann (K, G).

GUATEMALA: J. D. Smith, 3259 (K, N, C).

The Guatemala specimens have narrower pinnae and fewer of slightly larger sori. Specimens are also in the Kew Herbarium from Mexico collected by Graham, 404, and from Zhuitlancella, 2349. In the Gray collection is a single plant collected in Xalapa by Charles L. Smith, mounted on two sheets, that has a lamina 75 cm. in length and with a stout stipe 65 cm. long. Except for its greatly enlarged size, its relations are with this species. At least without more data we would not care to separate it. It has 36 pinnae, the lowest 18 × 3 cm. with four or more rows of small sori on either side. It is more than probable that Fée's illustration of *P. juglandifolia* Gen. Fil., *pl. 22 B. f. 1.* is taken from this species rather than the one he attempts to illustrate.

4. PHANEROPHLEBIA NOBILIS (Schlecht.) Fée, Gen. Fil. 282. *pl. 22 B. f. 2.* 1852.

Aspidium nobile Schlecht. Linnaea, **5**: 610. 1830.

Rootstock stout, creeping, the bases of the stipes with large shining brown scales: stipes 22–30 cm. long, pale brown: leaves 40 cm. or more long, with 15–23 pinnae which are 12–15 cm. long, 2.3–2.8 cm. wide, with obliquely obtuse bases and tapering curved apices; margins spiny, the spines more pronounced in the upper half of the pinna: veins free, about three times forked, the first branch bearing the sorus below the middle: sori small or

medium-sized, in about three rows, the innermost row less than 2 mm. from the midrib.

Apparently confined to central Southern Mexico. Specimens have been seen as follows:

MEXICO: San Nicolas, Bourgeau, 1049 (K, N, G, C, E*). *San Luis Potosi:* Schaffner (K, U). *Mexico:* Circa urbem Mexici, Schmitz, 26 (K). *Vera Cruz:* Oaxaca, Galeotti, 6554 (K); [Laguna de la Haciendo, Schiede]. Cañada, Bilemek, 474 (G, K); Orizaba? Müller, 48 (E); Cordoba, Bourgeau, 1645 (N).

This species can be easily distinguished from *P. remotispora*, which it closely resembles in size and habit, by its free veins and its inner row of sori located near the midrib. The original was collected by Schiede and Deppe as noted above.

5. **Phanerophlebia umbonata** sp. nov.

Rootstock stout, solid: stipes 15–30 cm. long, pale brown with a few broader scattered scales in the lower portion, and a considerable number of narrow slender ones above which also appear throughout the rachis: leaves 35–50 cm. long, with 25–38 pinnae which are 9–16 cm. long, 2–2.5 cm. wide, with an acute or obtusish base and tapering apex; margins bristly, the bristles scarcely projecting; veins free, very closely placed, usually three times forked, all the branches except the first extending to the margin: sori in about two rows, with a few scattering outliers, the innermost row about 4 mm. from the midrib; indusia remaining flat, with a central depression, and the center elevated into a distinct umbo.

Cool shaded cañons near Monterey, State of Nueva Leon, Mexico. C. G. Pringle, 14 June, 1888.

This plant was at first considered by Mr. Davenport as distinct from *juglandifolium* as indicated in our correspondence. The plant was issued in Mr. Pringle's sets without a specific name, but Mr. Davenport finally yielded his early impression and reported it under that convenient catch-all of the genus which *juglandifolium* has become through its treatment at Kew. American botanists of the past generation have regarded this treatment as authoritative, in spite of the vigorous protests of Moore, John Smith, Fée, Fournier, Mettenius and Kunze, variously expressed in the literature of the past forty years.

* Two pinnae "ex herb Gray."

There is nothing in the extensive collection at Kew, which numbers 43 specimens in this group, to match this species. Its relations are closest to *P. nobilis* and *P. remotispora*; from the former it differs among other points in its remote sori; from the latter in its free veins; from both in its larger number of pinnae, its scaly rachis and its very characteristic indusium.

We have seen specimens of the distribution in the Kew, Gray, Columbia, National, Eaton, Davenport and Philadelphia Academy herbaria, besides our own specimens, and they show very little tendency to vary.

6. **Phanerophlebia auriculata** sp. nov.

Rootstock short, creeping, densely covered with the bases of the persistent stipes, pale greenish, stramineous, 10–18 cm. long, with abundant dark brown lanceolate scales which become narrower above and almost hair-like: pinnae 10–16, rarely exceeding this number, forming a leaf 15–30 cm. long, the terminal practically the same size as the others, 5–7 cm. long, 2–2.5 cm. wide; lateral pinnae unequal at base, the lower angle obliquely truncate, the upper usually developed into a well-marked auricle; margins strongly serrate, sometimes more deeply incised, the teeth ending in sharp prickles projecting from the margin at an angle of 30°–40°; texture thin; veins free, 1–3-forked: sori in 2 more or less clearly marked rows with scattering sori between them and beyond the outer row.

This is the plant that has too long masqueraded as the representative of *Aspidium juglandifolium* from the Southwest, but has no close resemblance to that species, in habit, foliage, venation or texture. Although not the first collected, we shall assume Pringle, no. 831, from "cool damp cliffs, Mapula Mountains, Chihuahua, October, 1886," as the type of the species since it is more widely represented in collections and more representative. The first collected plants of this species we have seen are in Kew labeled simply Mexico, Dr. Coulter, 1713, and though possessing a greater number of pinnae (20) than the type are clearly this species. The first collection within the limits of the United States was made in Western Texas on the Mexican Boundary Survey near "Hueco Tanks and Van Horn's Wells." The only specimen from this collection is in the Columbia Herbarium and is marked *Aspidium juglandifolium* Kze., D. C. Eaton, January, 1880."

It was next collected by Mr. and Mrs. Lemmon, August 12, 1882, in "Conservatory Cañon," Huachuca Mountains, Arizona, and ten years later by Professor E. O. Wooton in the Organ Mountains, New Mexico. The range of the plant is quite circumscribed as it appears to be confined to northern Mexico and the adjacent portions of the United States. The following may be referred here.

MEXICO—*Chihuahua:* Pringle, 831 (K, G, N, C, P, U) Palmer, 450 (K, E, N, P); Hartman, 578 (K, G) (plants mostly immature).

ARIZONA: Lemmon, August, 1882 (K, E, G, U, N).

NEW MEXICO: Wooton, May, 1892 (U).

TEXAS: Mexican Boundary Survey (C).

7. **Phanerophlebia macrosora** (Baker)

Aspidium juglandifolium, var. *macrosorum* Baker, Jour. of Bot. **25**: 25. 1887.

Rootstock unknown: stipes brownish, the color extending throughout the rachis: pinnae coriaceous, brownish in drying, 2.5–3 cm. apart, 18–20 cm. long, 2.5 cm. wide, the apex tapering, the base unequally cuneate with a distinct cartilaginous margin and brownish spines throughout: veins free, 3 times forked, the primary branch rising from near the base, short, bearing the sorus near its middle: sori very large, hemispheric, 2.5 mm. in diameter, forming a continuous inner row 2 mm. from the midvein and one or two more or less irregular outer rows leaving a considerable bare space near the margin.

COSTA RICA: J. J. Cooper (K, G).

This very distinct plant was distinguished by Mr. Baker as a variety but we can discover no close relation to *juglandifolium** to which he united it. It does not appear to be closely related to any of the described species of the group, but does show a striking affinity with the next species with which it forms a somewhat natural group. It is known only from its type locality unless the imperfect specimen at Kew collected by Skinner in Guatemala should belong here. There are no specimens in the U. S. National Herbarium, although the original material was sent thence to Mr. Baker.

* Mr. Baker's brief description is as follows: "veins all free, conspicuously raised; sori much longer [*sic*] than in the type"

8. **Phanerophlebia Guatemalensis** sp. nov.

Rootstock unknown: stipes pale brownish, smooth: pinnae 20 × 3.5 cm., tapering at the apex, acute at base, with spinulose margins; veins free, prominent beneath in drying, four or more often five-forked: sori small, 1.2 mm. wide, mostly flattish in usually four rows either side the midvein, about equally distributed over the entire width of the pinnae: indusium small, withering.

GUATEMALA: San Miguel Uspantán, Depart. Quiché, alt. 7000. J. Donnell Smith, 3241 (G, N, P).

The specimen under this number in the Columbia Herbarium may be this species but more likely is something else. The plant is younger, the pinnae are smaller, the rachis is scaly, and its habit is quite different. There is a second Guatemalan plant in the Gray herbarium, collected by O. Salvin, that belongs here, as does another of the same collection at Kew. A tip of another specimen at Kew collected by Skinner is probably the same, although the pinnae are larger (27 × 4 cm.). The species finds its nearest alliance with *P. macrosora* but is abundantly distinct.

The geographic distribution of the known species may be compared more readily from the following map, in which the numbers of the stations correspond to the serial numbers of the species.

Distribution of the species of *Phanerophebia*: 1. *P. juglandifolia*, 2. *P. pumila*, 3. *P. remotispora*, 4. *P. nobilis*, 5. *P. umbonata*, 6. *P. auriculata*, 7. *P. macrosora*, 8. *P. Guatemalensis*.

INCERTAE SEDIS

1. *P. Lindeni* Fournier, Mex. Plantas **1**: 100. *pl. 4.* 1872.

As stated above there is considerable uncertainty regarding the relations of this species to *P. pumila*. Further collections will be necessary either to establish the validity of this species or reduce it to synonymy. Represented at Kew by Linden, 1551, collected in Chiapas.

2. In the Kew Herbarium is a specimen marked "Popocatepec., Mexique" Schaffner, no. 277, which is represented by a single leaf nearly a meter long, of which 45 cm. is stipe. The stipe is blackish at base, brownish, and then stramineous with occasional scales: pinnae 21, approximate in pairs, strongly bristly throughout, with a series of scattered scales everywhere on the veins beneath; the veins are free and the sori are in three rows very much as in *P. nobilis* which the plant resembles in many ways. Further material is here necessary to determine its position.

3. The specimens in the Kew and Gray herbariums collected by Fendler in Venezuela and distributed under no. 233 are not *P. juglandifolia* but present material is insufficent to determine its relations. It will thus be seen that while much is known of the genus, much yet remains to learn regarding complete distribution of the species.

The data presented by the above study illustrate several principles of wide application in the study of our flora, and particularly that portion of it which connects directly with the flora of Mexico and the West Indies, where, of necessity, the early types are found in the herbaria of the old world.

1. The necessity for the American flora to be monographed by Americans in whom some conception of distribution is apparent from the better perspective inherent in natives of a large country.

2. The coördinate necessity for American monographers to consult the large European collections before completing their studies of relationship and distribution. An earlier examination of Willdenow's type in this instance would have prevented much of the difficulty which has resulted from the misinterpretations of both Europeans and Americans. Few European botanists have taken the trouble to consult types on their own continent outside of the herbaria in which they work; consequently, for the study of the American flora, Americans must do this and do it systematically.

3. The uncertainty of referring to collectors' numbers unless the special herbaria in which the plant is consulted is also added. While the numbers of certain collectors are almost always homogeneous and represent a single species, those of certain other collectors are notorious for the want of uniformity of the specimens, since the commercial rather than the scientific conception has governed their distribution.

4. The crying necessity for field workers to give more attention to the subterranean portions of plants and their habits of growth. In all of the large collections of the species described above that have been examined in the best herbaria, we are still in practical ignorance of the rootstock and growth characters of nearly all the species. To understand biological characters and relationships we must know more than the average specimens of a *hortus siccus* can reveal.

Explanation of Plates

PLATE 359

1. Lower pinna of *P. juglandifolia*; the outline drawn direct from Humboldt's plant in the Willdenow herbarium.

2. *P. pumila* from Chiapas, Ghiesbreght.

3, 4. *P. auriculata* from Chihuahua, Pringle, showing different development of the basal auricle.

5. *P. umbonata*, Monterey, Pringle.

All the figures are natural size.

PLATE 360

1. *P. juglandifolia* from Humboldt's plant in the Willdenow herbarium.
2. *P. auriculata.*
3. *P. remotispora.*
4. *P. umbonata.*
5. *P. nobilis.*
6. *P. nobilis*, from the same leaf as No. 5 but slightly more magnified.

The figures were drawn from the leaves by direct tracings with a Leitz projection apparatus, and are magnified about 2½ diameters.

Both plates were drawn under my direction by Miss M E. Baker.

COLUMBIA UNIVERSITY, 4 April, 1899.

Studies in Sisyrinchium—I: Sixteen new Species from the Southern States

By Eugene P. Bicknell

Only a few years ago our familiar Blue-eyed Grass was looked upon as a plant common to nearly all parts of North America and as being the only one of its genus occurring in all that wide extent of country except in the farthest west.

The species—actually the extensive *group* of species—has thus been altogether misunderstood.

Nearly ten years ago Dr. Watson, after a critical study of eastern plants, announced that two forms might fairly be regarded as distinct; but this view was not generally understood, and Dr. Morong, who examined the problem in the interest of the A. A. A. S. "List," published in 1893–4, reached the conclusion that but one eastern species should be accepted.

A familiar acquaintance with the forms occurring about New York City enabled me, two years later, confidently to define three eastern species and to intimate that yet others awaited critical discrimination. It was then my hope that the subject would be taken up by some one having wider opportunity for study, but as no new word on blue-eyed grasses had been said up to the present year, while the need of a better understanding of them had been pressingly brought to my attention, the study of our species was resumed. It seems, however, that the group has not been so entirely neglected as had been believed. This appears from a recent signature of "Pittonia," wherein Professor Greene adds five species to the number known from North America. Three of these are well known to me as excellent species. Two of them come within the scope of the present paper, one a strongly characterized Floridan plant, well named *S. xerophyllum*, the other from Louisiana, *S. Langloisii*, which from the description is evidently quite different from anything that has come under my notice.

The present series of papers may be taken as preliminary to a general review of the genus in North America.

My acknowledgments to many friends and correspondents for

the loan of indispensible material must be deferred to the final writing.

Sisyrinchium corymbosum

Tall and long-leaved, 30–62 cm. high, in scant tufts not fibrose at base, arising from distinct ascending rootstocks, the crowded roots becoming coarse and woody. Plant pale dull green and glaucescent, turning yellowish or brownish-green in drying, the spathes and bracts of the inflorescence sometimes purplish-tinged: leaves decidedly equitant at base in stout plants, stiffly erect and thickish, or becoming so, some of them usually surpassing the first node of the stem, closely striate, not rugulose, the edges smooth or nearly so or upwardly ciliolate towards the very acute apex: stem 2–4 mm. wide, flattened, the stem proper often much broader than the firm wing-margins, the sharp edges smooth or nearly so: inflorescence long-branched, fastigiate-subcorymbose, two or three times compound, the second series of branches and the peduncles in clusters of two or three or more, arising from short sheathing bracts; branches 7–14 cm. long to the slender peduncles which are about as long and more or less serrulate: lowest bracteal leaf foliaceous, erect, 4–8 cm. long, those above much reduced and bract-like, 1.5–3.5 cm. long, usually clasping for about half their length and oppositely bi-carinate at base: spathes erect or deflected, small and narrow, mostly 12–15 mm. long, the nearly equal bracts thin and membranous, delicately nerved, acute or subulate, the margins rather broadly white-hyaline, the outer one tubular-clasping for at least one third its length; interior scales much shorter than the bracts: flowers blue, small, numerous, 8–11, on exserted, slightly spreading pedicels, 10–15 mm. long, becoming 15–22 mm. long in fruit; perianth delicate, apparently only 8–10 mm. long; stamineal column 3–4 mm. high: capsules broadly oblong, 3–5 mm. high, thick-walled, becoming dark brown; seeds globose, 1 mm. in diameter, faintly pitted or nearly smooth.

Florida: "Pine barrens near Jacksonville," A. H. Curtiss, "no. 4584, Curtiss' Second Distribution of plants of the southern United States," March 17, 1894, just in flower; June 1, 1894, over-ripe fruit. In Herb. U. S. National Museum.

Alabama: Mobile, Dr. Chas. Mohr, "Damp grassy banks:" just in flower April 5, 1897. In Herb. Dr. Chas. Mohr. Apparently a reduced form of the type, more slender and less branched, with elongated bracteal leaf.

A fine species, when well developed much the largest of the genus in the eastern United States. It is well characterized by its

branched, sub-corymbose, bracteate inflorescence and long stiffly erect leaves.

Sisyrinchium solstitiale

Known only in its early-flowering stage. Thinly tufted from erect woody rootstocks, the very slender roots long and wiry, the bases of the tufts clothed with chaffy and loosely fibrillose remains of decayed leaves. Stems and leaves pale dull green or glaucescent, turning dull brownish-green in drying: leaves very straight and erect, 15–25 cm. long, about half the height of the plant, very narrow when young, becoming 4 mm. wide, evenly graduated to the stiff acicular apex, striate, the nerves mostly prominent and obscure in an alternating series, the intervals minutely transversely rugulose; margins of the leaves for a width of about .5 mm. thinner and paler than the interior portion in evident contrast, at least in the dried plant, the extreme edge hyaline and minutely serrulate, becoming smooth; stems once or twice spirally twisted, forming an erect double curve, 20–46 cm. or more tall, becoming 3 mm. wide, the firm wings hyaline-margined and obscurely serrulate, becoming smooth: inflorescence elongated, narrow, from three rather remote nodes, each supporting an erect, foliaceous bracteal leaf and one or two peduncles, or the lower one bearing a slender branch having a bracteal leaf and two peduncles: spathes dull green, straight, 2–2.5 cm. long, the bracts stiff, closely striate-nerved, subequal, acute or aculeate, the outer one narrowly acuminate, its margins below white-hyaline, united around the inner for 6–8 mm., or over one third of its length; interior scales acuminate, finally equaling the bracts: flowers blue, rather strongly veined, apparently few, about 12 mm. long, on erect slightly exserted pedicels.

Collected by Mr. Geo. V. Nash in high pine land at Eustis, Lake Co., Florida, Aug. 10, 1894, the first flowers just opened. Type in herbarium Geo. V. Nash.

A very distinct species remarkable for its late flowering period. *S. xerophyllum* Greene, which occurs at the same locality, flowers in March, five months earlier in the season.

SISYRINCHIUM XEROPHYLLUM Greene, Pittonia, **4**: 32. 17 M. 1899.

Tufts coarsely brown-fibrose at base from compound woody rootstocks, each separate stem arising from a short annular caudex: stem and leaves dull brownish-green, glaucescent, turning dark brown, stiff, closely striate, transversely rugulose or granulose between the nerves, the edges rough-serrulate or becoming nearly

smooth: leaves stiff and erect, becoming flexuous in withering, attenuate-acute, 2–4 mm. wide, 25–45 cm. long: stems 15–35 cm. high, 2–3 mm. wide, prominently winged, above passing into an erect, often elongated, bracteal-leaf subtending a lateral-appearing cluster of 2–6 short-peduncled spathes and rarely also a branch bearing shorter peduncles; peduncles narrowly wing-margined, the edges obscurely roughened or becoming smooth, 2–6 cm. or even 10 cm. long, slightly curved, approximate and subequal, the outer two or three arising from a cluster of bracts borne on a very short prolongation of the stem. At flowering time the spathes are contiguous in a subsessile cluster: spathes erect or deflected, 14–19 mm. long, 3–4 mm. wide, dull green or slightly purplish, the bracts conspicuously hyaline-margined, subequal, stiff-herbaceous, striate-nerved, somewhat carinate, rather rigidly acuminate, the outer one sheathing for 2–4 mm. at base: interior scales crowded, at maturity exserted: flowers numerous, 8–12, rather large, violet; perianth delicate, becoming 12 mm. or more long; stamineal column 5–6 mm. high: capsules on pedicels 15–20 mm. long spreading or recurved from the tip of the spathe, 4–6 mm. high, trilobate-obovoid or subglobose, impressed at base and retuse, drying dark: seeds black, rugulose, becoming over 1 mm. in longer diameter.

The type is Nash's no. 133, "Plants of Central Peninsular Florida" collected in vicinity of Eustis, Lake County. This distribution furnished many excellent specimens in flower and early fruit collected, "March 20, 1894, in dry, sandy soil along road in high pine land region."

The Philadelphia Academy Herbarium has a specimen just in flower collected March 5, 1888, at Okahumpka, Sumpter County, by Isaac Burke.

The earliest collector of the plant would appear to have been Chapman, judging from an old sheet bearing his signature, now in the Herbarium of Columbia University, labeled "Florida, on Sand Hills, 1842."

On the strength of this specimen I drew attention to the plant three years ago in the paper previously referred to and published a brief description. The present description, which was ready for the press when the plant received its recent christening by Professor Greene, is given in full, being based on fairly extensive material, including flowers and fruit which Professor Greene had not seen.

Sisyrinchium tortum.

Stiff and erect in thin tufts coarsely fibrous at base arising from a dense cluster of rather stout fibrous roots; 15–30 cm. high, not turning dark in drying; leaves firm, the larger ones equaling the stems or nearly so, finally close-striate and faintly vermiculate-rugulose between the nerves, like the stems mostly 1.5–3 mm. wide with the edges smooth or obscurely denticulate-roughened; stem wing-flattened, usually one to four times spirally twisted and sometimes forming a shallow sigmoid curve; node usually only one, bearing a short erect bracteal leaf subequal with the two peduncles or shorter; occasionally a lower node bears two longer and more slender erect peduncles; bracteal-leaf with a broad clasping base which is strongly striate and oppositely more or less bicarinate; terminal peduncles two, rarely three, short, 2–5 cm. long, parallel or divergent, usually slightly unequal; spathes usually abruptly broader and thicker than the peduncles, 10–16 mm. long, becoming 3 mm. wide; bracts subequal or either one the longer, rather thin and membranous, striate-nerved, the outer one obtuse, or sometimes acute, the margins broadly hyaline, sometimes to the apex, united-clasping for 1–3 mm. at base; inner bract often broadly obtuse and scarious at apex; interior scales narrow and attenuate, shorter than the bracts; flowers pale blue on slender, loosely erect, finally exserted pedicels 15–22 mm. long; perianth 8–10 mm. long, the rather broad segments very delicately nerved; stamineal column short, 2–4 mm. high. Capsule not seen.

Mississippi and Florida: Biloxi, Miss. Professor S. M. Tracy, March 15 and 20, 1898, just in flower. St. John's River, Florida, in Herb. Acad. Nat. Sci. Philadelphia, a single specimen on a sheet bearing also specimens of *S. xerophyllum* Greene, and *S. Floridanum*, the former collected by Isaac Burke in 1888.

Apparently nearest *S. xerophyllum* Greene, but unmistakably distinct.

Sisyrinchium Carolinianum

In loose tufts fibrose-coated at base, arising from erect or ascending rootstocks, the roots thickly clustered and rather coarsely fibrous, plant pale and glaucescent, often rather a bright yellowish green; leaves often much shorter than the stem, though sometimes reaching the first node, rather thin and openly erect, rather weakly striate-nerved, mostly 2–3 mm. wide or a few much broader, even 5 mm. wide, acuminate, the margins usually distinctly serrulate: stems erect, 2–3 mm. wide, broadly winged, the edges mostly serrulate or even ciliolate; nodes of stem one or two, each bearing a foliaceous bracteal leaf and two or three rather long

more or less diverging peduncles; prolongation of stem beyond the first node commonly 5–7 cm. long and somewhat outcurved; peduncles 4–8 cm. long, often ciliolate-denticulate: spathes green or sometimes purplish, as a rule not at all deflected, 15–20 mm. long, the bracts sub-equal or either one slightly the longer, varying from herbaceous-attenuate to scarious-obtuse and mucronulate; interior scales about half the length of the bracts: flowers 3–8, on very delicate slightly exserted, loosely erect pedicels; perianth very delicate, pale violet-blue, 8–10 mm. long; stamineal column 4–5 mm. long: fruit not seen.

Western North Carolina and central South Carolina to Georgia, Alabama and Mississippi. Beginning to flower in the Carolinas in early May, at its southern limit a month earlier.

North Carolina: near Columbus, Polk Co., E. C. Townsend.

South Carolina: Andersonville, Anderson Co., Professor Lewis R. Gibbes, 1886. Type, in Herbarium N. Y. Botanical Garden; near Hamburg, Gibbes; Camden.

Georgia: Augusta, A. Cuthbert; Stone Mountain, Dr. Small.

Alabama: Auburn, F. S. Earle and C. F. Baker; Mobile, Dr. Chas. Mohr.

Mississippi: E. Hilgard.

Appearing somewhat intermediate between *S. graminoides* Bicknell and *S. Atlanticum* Bicknell, but perfectly distinct from both.

Dr. Mohr's specimens from Mobile and those from Mississippi are aberrant and may represent yet another species.

Sisyrinchium Floridanum

Tufts densely fibrillose at base, roots clustered, slender and wiry, stems and leaves 25–40 cm. high, pale dull green and glaucescent, not discoloring in drying, minutely crystalline-puncticulate; leaves numerous, equaling the stems or shorter, stiffly erect or ascending, becoming flexuous in withering, mostly 2–3 mm. wide, rarely 4 mm., closely and firmly striate, attenuate to the terete or sub-terete slender-pointed apex, the edges smooth; stems sub-terete with narrow but firm wing-margins, 2–3 mm. wide, the edges smooth, bearing near the top a slender, erect bracteal leaf, shorter than the 2–3 usually erect peduncles, sometimes erectly prolonged beyond the node and bearing a second cluster of three shorter peduncles; peduncles very slender, mostly less than .5 mm. wide, narrowly margined, smooth or sometimes obscurely denticulate, subequal, or usually so, 5–10 cm. long, transversely constricted below the spathe: spathes green or

slightly purplish, mostly erect, narrow, 15–20 mm. long; bracts subequal, striate-nerved, hyaline margined, attenuate, mucronulate-acute or aculeolate, or the apex of the inner one apiculate from a narrowly scarious-obtuse or even bifid tip, the outer one clasping for 2–5 mm. at base; interior scales about equaling the bracts or slightly exserted; flowers 5–11, on slender exserted pedicels, pale blue, perianth delicate, about 10 mm. long: capsules pale green or purplish tinged, trigonous-subglobose or obovoid, abruptly contracted above and below, 3–4 mm. high, on pedicels 20–25 mm. long, exserted and slightly diverging for about quarter of their length: seeds not fully mature.

Based chiefly on Nash's no. 13, "Plants of Central Peninsular Florida"; collected "near Lake Dot, Eustis, on dry sandy hillside, March 12, 1894." In flower and fruit.

The same plant was collected by Prof. Underwood, also at Eustis, in 1891, and further specimens have been examined as follows: Hibernia, March, 1869, W. N. Canby; Pine Barrens near Jacksonville, March 17, 1894, A. H. Curtiss.

Sisyrinchium Nashii

Nearly related to *S. Floridanum*, but much smaller and slenderer, and flowering in June and July instead of March.

Very slender and delicate, growing in thin wisps of a few stems and leaves sheathed with a dense fibrillose coating around the base, leaves few, erect, about half the height of the stem, .5–2 mm. wide, rather less closely and strongly striate than in *S. Floridanum* and frequently denticulate, especially towards the scarcely terete apex: stems few, erect, 20–30 cm. high, mostly 1 mm. or less wide, the very narrow margins often, or usually, minutely denticulate; leaves, stems and peduncles sometimes obscurely roughened with minute points on the sides: bracteal leaf almost setaceously slender, much shorter than the peduncles; peduncles 1–3, almost filiform, often not perceptibly margined, more or less unequal, mostly 4–6 cm. long: spathes narrow, 13–15 mm. long, the bracts mostly thinner and less sharp-pointed than in *S. Floridanum*, the inner one frequently surpassing the outer and scarious-obtuse at the apex; flowers smaller than in *S. Floridanum*: capsules pale, 2–3 mm. high, subglobose or often broader than long on slenderly exserted subspreading pedicels 17–22 mm. long: seeds subglobose, black, finely rugulose-pitted, with a large umbilicus.

Based on Nash's no. 1395, "Plants of Central Peninsular Florida" collected near Lake Swatara, Eustis, in dry sandy soil of

low pine land region, July 24, 1894, in flower and mature fruit; and Nash's no. 1914, collected at Eustis, June 11, 1895, in full flower and with very young fruit.

So near to *S. Floridanum* that I should scarcely have thought of looking for specific differences between the two plants but for the wide difference in their flowering periods as shown by the labels. Mr. Nash is satisfied that the plants are distinct and recalls that in the field he regarded the smaller plant of low pine land as certainly different from the similar species collected in the same region, but in high pine land four months earlier in the season.

Sisyrinchium rufipes

Early flowering stage: Thinly tufted from ascending rootstocks, the old leaves disintegrating to form a loose coating of bright rufous-red fibers about the base of the plant. Stem and leaves rather bright pale green and glaucescent partly turning a dull brownish green; leaves very slender, about the height of the stem, straight and erect but becoming widely flexuous in withering, 1–1.25 mm. wide, slenderly attenuate, more or less granular-scabrous between the close nerves, the margins finely sharp-serrulate; stems erect, about 1 mm. wide, narrowly margined, the edges closely appressed ciliolate-serrulate; bracteal leaf slender and erect, subtending two short suberect or outcurved peduncles and sometimes also a branch bearing a bracteal leaf and two short-peduncled spathes; branches and peduncles hirsutulous-ciliolate on the edges and often roughened with minute points on the sides: spathes short, about 12 mm. long, the bracts somewhat divergent, sharp-acuminate or the inner one scarious-obtuse and apiculate, the outer one hyaline margined below and slightly sheathing at the base: flowers 2–5, small, blue, on delicate slenderly exserted pedicels 15–17 cm. long; perianth about 8 mm. long; stamineal column 4 mm. high.

Georgia: Augusta, A. Cuthbert, "dry sand hills," March 24th. In herbarium J. K. Small.

Imperfect specimens from Summerville, South Carolina, collected by Professor Lewis R. Gibbes, April 9, 1850, just in flower, are probably to be referred here. They are more slender than the type with flexuous stems and leaves, and are nearly smooth throughout, but with the bracts minutely granular-scabrous.

In Herb. N. Y. Botanical Garden.

A specimen in Herb. U. S. Nat. Mus. no. 220, 346, wet pine

barrens, Craven County, North Carolina, July 3d (G. McCarthy) doubtless also belongs here, but shows a mature plant of very different aspect. The stems are tall, and about twice spirally twisted, the tallest 47 cm. high and bearing at the node two slender peduncles and a longer divergent branch terminating in a cluster of three peduncles; the spathes are slenderer and longer than in the type, with narrow stiffly attenuate slightly unequal bracts. The capsules are brown and thick-walled, ovoid subglobose, and 3.5 mm. high; the immature seeds are rugulose-pitted and about 1.25 mm. in diameter. The stem and leaves, slightly broader than in the type, have dried very dark, but they show the same character of densely ciliolate-serrulate margins and also indications of granulose roughening on the sides; the fibrous tuft at the base of the plant is of much the same character as in the type but of a duller, more brownish color.

Sisyrinchium fuscatum

Growing in thin tufts, 15–50 cm. high, fibrose about the base, and arising from rather stout rootstocks and clustered widely spreading fibrous roots. Plant dull green and glaucescent, crystalline puncticulate, discoloring in drying, sometimes becoming almost black: leaves long and slender, but shorter than the stems, firm and erect, becoming flexuous, .5–2.5 mm. wide, acute or slenderly subterete at the apex, strongly close-striate, the edges smooth or denticulate-roughened: stems long and slender, erect, .75–2 mm. wide, at least the wings distinctly striate, the edges minutely denticulate, becoming smooth; bracteal leaf short, and erect, attenuate above, the broader basal portion strongly close-striate, surpassed by the two closely approximate and subequal, erect, slender peduncles, which are subterete and only 2–6 cm. long: spathes erect, narrow, but abruptly wider than the constricted peduncle, 15–18 mm. long, the bracts equal or nearly so, stiffly herbaceous and firmly close-striate, closely approximate, cuspidate-acuminate, the outer one clasping for 2–4 mm. at base; interior scales much shorter than the bracts: flowers 5–8, blue, on erect, more or less exserted pedicels, 18–25 mm. long; perianth about 10 mm. long, the segments narrow, rather closely and strongly nerved: capsules 2.5–4 mm. high, broadly subglobose, drying dark.

Western Florida to Mississippi.

Flowering from March to May.

Florida: Apalachicola, Chapman.

Alabama: Flomaton, Escambia county, April 23, 1898, C. F. Baker.

Mississippi: Biloxi, Prof. S. M. Tracy; Ocean Springs, Miss Skehan.

I find two sheets of this species in Herb. Missouri Botanical Garden, "ex coll. D. V. Dean," but without other record.

Sisyrinchium flagellum

Very slender and flexuous in thin tufts, not fibrose at the base, the roots becoming rather coarsely fibrous; pale dull green and slightly glaucescent, darker in drying, 20–32 cm. high. Leaves as long as the stems or nearly so, narrow and flexuous, 5–1.5 mm. wide, distinctly rather few-striate, smooth-edged or serrulate at the attenuate acute apex: stems erect, usually more or less flexuous, and geniculate at the nodes, .75–1.5 mm. wide, narrowly wing-margined, smooth-edged; nodes one or two, remote, the lowest about midway in the stem or higher, supporting a long leaf and one or two long slender peduncles, the upper node bearing a shorter leaf and two or three peduncles; peduncles very long and slender, 5–12 cm. long, mostly .5 mm. wide, smooth-margined, subequal, approximate or slightly divergent: spathes often abruptly deflected, narrow, 15–20 mm. long, the bracts slightly keeled to the apex, subequal or the inner one longer, the outer one narrowly acuminate and sharp-pointed, hyaline-margined below and clasping for 5–7 mm. at base; the inner one often scarious margined to the abruptly mucronulate apex; interior scales much shorter than the bracts: flowers not well made out, of some shade of blue and apparently of medium size: capsules 4–6 on erect slightly exserted pedicels 18–20 mm. long, trilobate-subglobose, retuse and impressed at base, about 4 mm. high, drying brown, the surface minutely rugulose: seeds globose, finely alveolate, 1 mm. or more in diameter.

South and West Florida: "Pine Key, Blodgett." In Herbarium of Columbia University.

Manatee County, Dr. J. T. Rothrock; "open glades," March 5, 1887; in flower and fruit. Specimens in herbarium of College of Pharmacy, New York and Philadelphia Acad. Nat. Sci.

Sisyrinchium Miamiense

About 20 cm. or more high, growing in small erect tufts from short descending rootstocks, the roots long, somewhat woody and nearly simple. Plant apparently dull green and glaucescent, drying dark: leaves erect, about three quarters the height of the

plant, 1–1.5 mm. wide, cuspidate-acute, with somewhat thickened corneous tips, rather strongly but not very closely striate-nerved, serrulate: stems rather loosely erect, about the width of the leaves, distinctly wing-margined, denticulate-serrulate, bearing two or three erect peduncles at the top and sometimes an ascending branch lower down; peduncles approximate, 3–7 cm. long, their margins serrulate to smooth: spathes mostly erect, 13–15 mm. long, the bracts rather sharply keeled to the apex, the outer one stiffly acute, slightly hyaline-margined below and clasping for 1–4 mm. at base, slightly surpassing the inner, which is scarious-obtuse at the apex and apiculate; flowers 5–8, blue, apparently of medium size; capsules on exserted pedicels 15–18 mm. long, 3–5 mm. high, trigonous-obovoid or somewhat pyriform, mucronulate, thick-walled, brown, minutely rugulose: seeds irregularly subglobose- and bluntly angled, 1–1.25 mm. in diameter, faintly rugulose- pitted, obscurely umbilicate.

Southeast Florida; Miami, Dade County, Charles L. Pollard and G. N. Collins, April 4–7, 1898; Plants of subtropical Florida, no. 264; last flowers and mature fruit.

Sisyrinchium scoparium

Pale green and glaucous, growing in close tufts fibrose at base, from contracted rootstocks and rather coarsely fibrous roots, 15–50 cm. high. Leaves erect and very slender, equaling the shorter stems of the tufts but much shorter than the longer ones, 1 mm. or less to 1.75 mm. wide, very acute, the edges sometimes obscurely roughened; stems equally narrow with the leaves, very smooth, the striate wing-margins sometimes obscurely roughened above on the edges; inflorescence when well-developed appearing somewhat flabellately short-branched from two often approximate nodes of the stem, the lower node bearing one or two short, slender peduncles, the upper one two or three shorter peduncles; the peduncles and short branch all slightly diverging; bracteal leaves slender, rarely surpassing the spathes: peduncles 2–5 mm. long or the lower ones longer, denticulate on the margins; sometimes the stems bear but one node and two short peduncles; spathes erect, 12–18 mm. long, the bracts rather strongly close-striate, acuminate, subequal, the tips finally spreading; outer one narrowly hyaline-margined below, clasping for 2–5 mm.; interior scales about three quarters the length of the bracts; flowers 6–11, violet blue; perianth apparently with rather narrow segments, about 10 mm. long; capsules clustered on fascicled distinctly margined pedicels 14–20 mm. long, somewhat obovate or oblong-subglobose, 2–5 mm. high, thick-walled and drying dark, remaining slightly puberulent at maturity: seeds globose, black, finely pitted, 1 mm. in diameter.

Coast of Mississippi. Flowering from March to May.

Biloxi, April 27, 1898, C. F. Baker. Type in Herb. Alabama Biological Survey, no. 1496, also Biloxi, April 2, 1898, S. M. Tracy.

Sisyrinchium implicatum

Growing in close tufts from contracted rootstocks and producing a dense entangled mass of slender fibrillate roots; often assurgent at base, the numerous weak stems flexuous-erect or spreading in a loose entanglement, pale dull green, perhaps slightly glaucescent. Leaves very slender, weakly erect or flexuous, .5–1 mm. wide, 5–15 cm. long, narrowly blunt-pointed or acute, finely close-striate, the edges smooth, or serrulate when young: stems equally slender with the leaves narrow-margined, the edges smooth or obscurely denticulate, geniculate near the top at the single node and bearing 1 or 2 short peduncles with deflected spathes; peduncles almost capillaceous, margined slightly curved or straight, approximate, 2–4 cm. long, surpassing the slender bracteal leaf: spathes very small, the bracts somewhat membranous and finely nerved, equal, or either one slightly longer than the other; the outer one 10–15 mm. long, contracted-clasping for 3–5 mm. at base, narrowly acute, hyaline-margined below; inner bract acute or scarious-obtuse and apiculate: flowers 3–5, small, on pedicels slightly exserted or scarcely so; perianth very delicate and faintly nerved, pale blue, apparently about 8 mm. long; stamineal column about 5 mm. high.

Mississippi: Calhoun Co., "Wet bottoms," April 1858, E. Hilgard. In Herbarium Missouri Botanical Garden.

Sisyrinchium rosulatum

Prostrate or ascending in rosulate tufts, or sometimes nearly erect, pale dull green or glaucescent not turning dark in drying, the denser tufts from contractedly short-branched woody rootstocks, the roots delicate and fibrillate: tufts sometimes very small, becoming 25 cm. in diameter: basal leaves short, 2–8 cm. long, 1–2 mm. wide, the broadened base membranous and hyaline-margined, the weak nerves becoming rather distant, in larger leaves .5 mm. apart: apex of the leaf apiculate acute or sometimes more attenuate, the margins denticulate to closely sharp-serrulate or even sub-ciliolate: stems of the smaller tufts very short, only 6–30 mm. long, often concealed by the leaves, bearing one or two much longer peduncles: stouter plants may become 20 cm. high, the stems with two remote nodes each supporting an erect leaf and mostly two peduncles, or rarely the lower node developing a slender erect branch: stem slender, subterete, narrowly margined,

the edges denticulate-serrulate: stem leaves much shorter than the peduncles, rather broadly flat-sheathing for 10–15 mm. above the node: peduncles long and slender, approximate or diverging, 2.5–10 cm. long, often more broadly margined than the stem, the edges aculeolate-denticulate: spathes relatively large, straight or deflected slightly transversely constricted at base, mostly about 2 cm. long, both bracts somewhat foliaceous, the outer one more attenuate and usually slightly the longer, rarely both bracts broadly foliaceous and prolonged, the inner one hyaline-margined nearly to the top, the outer one below the middle: flowers not seen, reported to me by Dr. Mohr as being of a reddish-purple or wine color: capsules 3–5, broadly subglobose, 2.5–3.5 mm. high on capillary flexuously spreading pedicels 2–3 cm. long, pale, but purplish-tinged along the sutures: seeds numerous, very small, .5–.75 mm. long, finely alveolate, umbilicate, assymetrically cuneate and angled.

Dry open places in sandy soil, coast of South Carolina and Alabama.

South Carolina: Sullivan's Island, May 8, 1852, Professor Lewis R. Gibbes. In fruit. In Herb. N. Y. Botanical Garden.

Alabama: Mobile, April 6, 1896, May 5, 1896, Dr. Charles Mohr. In fruit. In Herb. Dr. Mohr and Missouri Botanical Garden.

Very distinct from any of our eastern species, having its affinity with certain South American forms and a Mexican and Central American species which is perhaps unnamed.

Sisyrinchium furcatum

Loosely tufted, from rather stiff nearly simple fibrous roots, 10–15 cm. high; dull green, drying rather dark, mostly purplish about the nodes and bracts. Leaves about the height of the plant, erect, attenuate-acute, .5–1.5 mm. wide, rather thin, finely striate-nerved, the edges obscurely denticulate-roughened to smooth: stems 1–1.5 mm. wide, the wing-margins distinctly several-striate and denticulate, casually simple but commonly forking into 2 or sometimes 3 peduncles 3–6 cm. long, subtended by a slender, erect, bracteal leaf of about equal length: spathes relatively broad, about 3 mm. wide across the middle, the bracts delicately nerved and thin membranous on the sides, with broadly hyaline margins, mostly acuminate, the outer one usually prolonged beyond the inner 3–6 mm. and clasping for 2–3 mm. at base, the inner one often emerging rather abruptly; interior scales rather broad, brownish-tinged, much shorter than the bracts: flowers 4–6, blue; perianth very delicate and faintly nerved, 8–10 mm. long; staminal column 4–5 mm. high: fruit not seen.

Southeastern Louisiana: Hammond, Tangipahoa Co., Lewena Gallup, April 4, 1889, "pine lands," in full flower. In U. S. Nat. Herb.

Sisyrinchium sagittiferum

Thinly tufted and slightly fibrillose at base, apparently not glaucous, drying dark, 10–15 cm. high. Leaves about equaling the stems .5–1.5 mm. wide, thin, striate-nerved, acuminate, the edges serrulate to smooth: stems very slender, .5–.75 mm. wide, margined to narrowly winged, the wings distinctly striate, mostly denticulate-roughened or above even papillose-aculeolate on the edges; spathes small, erect, terminating the stems and four or five times as broad, subequal or the outer one prolonged: outer bract 11–27 mm. long, acuminate or attenuate, sometimes surpassing the inner bract 15 mm., the white-hyaline margins only slightly united at base; inner bract 10–12 mm. long, the margins broadly white-hyaline, the apex abruptly acute or broadly scarious and truncate or emarginate with excurrent midvein: interior scales equaling the inner bract or nearly so: flowers 3–7, small, on almost hair-like flexuously exserted pedicels about 15 mm. long: perianth apparently about 8 mm. long, color faded out; stamineal column 4 mm. high: capsules undeveloped.

Texas, May, 1839, Dr. Ridell. In Herb. Dr. Chas. Mohr.

Sisyrinchium scabrellum

Caespitose in close erect tufts, arising from a dense cluster of fibrous roots, 25–40 cm. high, slightly fibrillose at base; dull pale green and glaucescent, the spathes often yellowish green and purplish, the rather long sheathing bases of the leaves purplish-tinged. Leaves stiffly erect, three quarters the height of the stem, very narrow, 1–2 mm. wide, tapering and cuspidate-acute, closely striate, scabrous all over or even canescently incrustate with minute setulose papillae, less so or quite smooth above, sometimes nearly smooth throughout: stems simple, stiff and slender, 1–2 mm. wide, flattened, sometimes glabrate but usually scabrous, at least below, sometimes equally so with the leaves, the finely-striate wing-margins roughened on the edges or even minutely hispidulous-aculeolate: spathes geminate at the top of the stem (in one instance three together) sessile or the outer one short-stipitate, the bracts herbaceous and striate, encrusted with minute whitish points or almost hispidulous-scabrous; primary bract stiff and erect, much elongated, 3.5–11.5 cm. long, slenderly attenuate, or broadened and foliaceous above the spathe, usually smooth or nearly so above; inferior outer bract attenuate, often slenderly prolonged, 1.2–3.8 cm. long, surpassing the inner bracts, which are less herbaceous, scarious-mar-

gined and acute or mucronulate; interior scales shorter than the inner bracts: flowers 3–6, pale blue, on slender, loosely erect or flexuous, much exserted pedicels 1–2 cm. long; perianth delicately membranous, 8–12 mm. long; stamineal column 4–6 mm. high. Mature fruit not seen.

North Carolina: Buncombe County, near Biltmore, May 10, 1898, in full flower, ex. Biltmore Herbarium; Stanley County, at the Falls of the Yadkin River, April 20–24, 1896, just in flower. John K. Small.

Dr. Small's specimens are darker green and much less scabrous than those from Biltmore, with larger and more foliaceous primary bracts and thicker roots.

Revision of the Genus Guardiola

By B. L. Robinson

The small and natural genus *Guardiola* extends from the mountains of southern Arizona to southern central Mexico. Its Mexican distribution is a peculiar one. Well represented in the northwestern states of Sonora, Chihuahua, and Tepic, it passes southeastward to the state of Vera Cruz on the Gulf, but is as yet unknown in northeastern Mexico and, what is more surprising, appears to form no part of the rich and varied vegetation of the southwestern states of Oaxaca and Guerrero. The genus is well marked among the melampodioid Compositae by its peculiar habit, cylindrical heads, broad thin scarcely herbaceous much imbricated involucral scales, and characteristic columnar achenes. Mexican material of the genus has of late been accumulating rapidly at the Gray Herbarium and the impossibility of bringing the diverse forms satisfactorily under the four or five hitherto recognized species has led to the preparation of the present synopsis.

The material of *G. Tulocarpus* now at hand shows that Dr. Gray's varieties *arguta* and *angustifolia* are too remote to make intergradation likely, and they are accordingly here treated as independent species.

Synopsis of the Species

* Involucral scales dorsally convex but not carinate: leaves broadly ovate to rotund, cordate at the base.

+ Heads large (for the genus) and few, in terminal umbelliform cymes, these exceeded in length by the subtending foliaceous bracts: leaves suborbicular, closely sessile.

1. G. ROTUNDIFOLIA Robinson, Proc. Am. Acad. **29**: 317.

Hills near Tequila, Jalisco, *Pringle*, no. 4571. Type in herb. Gray.

+ + Heads of medium size, often numerous, the cymes exceeding the rather small subtending bracts: leaves ovate, sessile or subsessile, shallowly cordate.

2. G. PLATYPHYLLA Gray, Pl. Wright. **2**: 91.

Arizona, by streams, Sta. Catalina Mountains, *Pringle*; Wash of El Rialta, *Lemmon*; Sonora, *Wright*, no. 1236 (type, in herb. Gray); *Thurber*, no. 999; *Schott*; *Palmer*, no. 280 (coll. of 1890);

Hartman, nos. 124, 270; *F. E. Lloyd*, no. 420; S.W. Chihuahua. *Palmer*, no. 35 (coll. of 1885).

+ + + Heads few and large, in umbelliform clusters at the ends of the branches, the subtending bracts almost as large as the foliar leaves: leaves petiolate, subreniform-ovate, deeply cordate.

3. **G. Rosei** sp. nov.

Slender glabrous and glaucous perennial, 3–4 dm. high: stems terete, striate; branches opposite: petioles 6–8 mm. long; leaves subreniform-ovate, coarsely cuspidate-dentate, 3-nerved from the base, 4–5.5 cm. long, 3–4.8 cm. broad, bright green above, glaucous beneath, acutish and cuspidate at the tip, cordate with a rather deep open sinus at the base; the floral leaves scarcely smaller; 3-headed terminal cymes surpassed by their subtending bracts; pedicels glabrous, glaucous, 1–2 cm. long; involucral scales oblong, obtuse, 1.3 cm. long, 5 mm. broad: ray-flowers about 3; ligules oblong, white, 4 mm. long, the slender tubes 6 mm. in length: achenes moderately compressed, upwardly villous under a lens, at maturity 6 mm. long, fuscous, minutely mottled; disk flowers 4–5-parted.

Collected between Sta. Gertrudis and Sta. Teresa, Tepic, Mexico, by Dr. J. N. Rose, 8 August, 1897, no. 2078, and 96 km. south of Guadalupe y Calvo, S. W. Chihuahua, altitude 2300–2600 m., by E. W. Nelson, August, 1898, no. 4806. Types in herb. Gray and herb. U. S. Nat. Museum.

* * Outer involucral scales carinate.

4. **G. carinata** sp. nov.

Branched slightly lignescent perennial, finely ciliated upon the young petioles, otherwise glabrous: stem slender, terete, glaucous: petioles about 1.3 cm. long, glabrate: leaves lance-oblong, subhastately angled or toothed on either side the subcordate base, finely serrate with incurved cartilaginous-tipped teeth, scarcely pale beneath, 3–4 cm. long, 1.8–2.2 cm. broad: pedicels 7–9 mm. long, axillary or cymose at the ends of the branches; involucres in anthesis 1.1 cm. long; scales ovate, obtuse to acuminate, the 3 outer ones strongly carinate: ray-flowers much later in their development than the disk-flowers, the heads thus proterandrous: ligules minute: achenes pale, subterete, 6 mm. long, upwardly villous under a lens, minutely mottled.

Collected by Dr. J. N. Rose at Acaponeta, Tepic, Mexico, 23 June, 1897, no. 1498. Well marked by its carinate involucral scales, which are not found elsewhere in the genus. Types in herb. Gray and herb. U. S. Nat. Museum.

*** Involucral scales dorsally convex but not carinate; leaves lance-oblong to linear, petioled.

+ Leaves cordate or subcordate at the hastately lobed base, coarsely toothed.

5. **G. odontophylla** sp. nov.

Glabrous, somewhat glaucous: stem terete, purple, striate, branched: petioles 8–10 mm. long; leaves lance-oblong, coarsely and somewhat doubly dentate, 5 cm. long, 2.2 cm. broad at the hastately bilobed base, green on both sides, the teeth rather broad, spreading, scarcely at all incurved, acutish to acuminate; the floral leaves scarcely reduced, bearing elongated basal lobes: heads subumbellate by 2's and 3's at the ends of the branches; pedicels 3–4 mm. long; involucral scales lance-oblong, acute, 1 cm. long: achenes ashy, punctate, upwardly villous under a lens, compressed, 7 mm. long.

Collected by E. W. Nelson between Ramos and Inde, Durango, 11 to 14 August, 1898, no. 4683. Types in herb. Gray and herb. U. S. Nat. Museum.

+ + Leaves cuneate or obtuse at the base.

++ Heads relatively broad; involucres 4 mm. thick; pedicels 3–14 mm. long: leaves (with rare exceptions) hastately toothed at the base; the floral leaves considerably exceeding the cymes.

= Leaves serrate with close incurved teeth.

6. G. MEXICANA Humb. & Bonpl. Pl. Aeq. **1**: 144, *t. 41*; HBK. Nov. Gen. et Spec. **4**: 247; Gray, Pl. Wright, **1**: 111.

G. atriplicifolia Gray, l. c.

Michoacan, *Humboldt & Bonpland*, *Pringle*, no. 4167; Jalisco, *Palmer*, no. 214 (coll. of 1886), *Pringle*, no. 3484; Zacatecas, *Rose*, no. 2737; Morelia, *Galeotti*, no. 2418; Mirador, *Sartorius*; Morelos, *Pringle*, no. 6184; Volcano of Toluca, *Heller*, no. 443.

A portion of Galeotti's no. 2418 (the type number of *G. artiplicifolia* Gray) in herb. Gray so closely matches the perennial specimens of *G. Mexicana* that, although originally described as an annual, it seems undoubtedly this species, to which, in fact, Dr. Gray himself later reduced it (Proc. Am. Acad. **22**: 423).

= = Leaves dentate; teeth very sharp, spreading.

7. **G. arguta** (Gray)

G. Tulocarpus var. *arguta* Gray, Proc. Am. Acad. **21**: 387.

Chihuahua, *Pringle*, rocky hills near the town of Chihuahua,

no. 678 (type in herb. Gray), also in foothills of the Sierra Madre, no. 1281. This species differs from *G. Tulocarpus* in its large heads and conspicuously elongated bracts, as well as in the differently toothed leaves.

++ ++ Heads smaller, numerous; involucres 2.7 to 3 mm. in thickness: leaves not hastately toothed at the base: pedicels 1 to 2 (or rarely 4) mm. long.

= Upper bracts of the inflorescence elongated, surpassing the heads: leaves narrowly lanceolate to linear.

8. **G. angustifolia** (Gray)

G. Tulocarpus var. *angustifolia* Gray in Wats. Proc. Am. Acad. **22**: 423.

Copiously and cymosely branched, 4–6 dm. high; petioles 8 mm. long; leaves narrowly lanceolate to linear, scarcely paler beneath, serrate with five incurved callous-tipped teeth, not hastately toothed at the cuneate base, 7–8 cm. long, 1.2–1.4 cm. broad; heads numerous in small umbelliform, about 5-headed cymes; pedicels very short, 1–3 mm. long; involucres 7 mm. long, less than 3 mm. in diameter; scales acute: achenes gray, mottled, upwardly villous under a lens, 6 mm. long including the sterile base.

Jalisco, ravines near Tequila, *Palmer*, no 360 (type in herb. Gray), and on hillsides near Guadalajara, *Pringle*, no. 1737.

Differs from *G. Tulocarpus* not only in the form of the leaves but in the length of the bracts and general character of the inflorescence.

= = Upper bracts very small, much shorter than the heads: leaves lance-oblong.

9. G. TULOCARPUS Gray, Pl. Wright, **1**: 111.

Tulocarpus Mexicanus Hook. & Arn., Bot. Beech. 299, *t. 63*.

Tepic, *Lay & Collie*; Zapelote, State of Tepic, *Lamb*, no. 580; between the city of Mexico and Mazatlan, *Gregg*, no. 585; Colima, *Palmer*, no. 1198 (coll. of 1891).

Readily recognized by its numerous small heads in close compounded small-bracteal cymes.

GRAY HERBARIUM OF HARVARD UNIVERSITY.

New Plants from Wyoming. VII

By Aven Nelson

For the past several years I have been observing the species of *Paronychia* with some care, and a large series of specimens have been secured to illustrate those credited to this region. Among those secured are authentic specimens of *Paronychia depressa* (T. & G.) Nutt. That Nuttall's plant deserves specific rank I think can hardly be questioned by one familiar with it in the field. Nuttall, in selecting the name *depressa*, must have fully understood its habit, but it seems that no one since has appreciated the appropriateness of the name. The descriptions of it that are current are all misleading. Height is assigned to the stems but they are absolutely prostrate-spreading, forming close mats upon the surface of the ground, a fact that herbarium specimens fail to show. This will at once separate it from that species with which it has been associated, though they are also otherwise very different. To place it on record a little more fully than has heretofore been done the following characters may be noted:

Prostrate-spreading, forming close mats, the very numerous dichotomous stems springing in a cluster from the summit of a woody root, all but the herbaceous portion buried in the loose soil, silvery, this appearance due to the large scarious stipules and the short, silvery, scabrous pubescence: leaves linear, exceeding the internodes, cuspidate or mostly bristle pointed, the lanceolate stipules more conspicuous than the leaves (which they nearly equal) and with them closely clothing the short stems: flowers singly in the axils or in small cymes, nearly sessile, surpassed by the subtending leaves and bracts: sepals with a cone-shaped tip half as long as the rest of the sepal, awn about equaling the tip, at the base of which the arch at the inner face is borne: filaments very short, exceeded by the slender staminodia.

This I have secured but once and I am sure it is not common. My no. 461 has been compared with the type in Torrey Herb. at Columbia, by Dr. Rydberg, who says it is a very close duplicate of Nuttall's specimen.

Of frequent occurrence in Wyoming is *Paronychia sessiliflora*

Nutt. but of this there are two or three forms, one of which seems sufficiently well marked to be constituted a variety.

Paronychia sessiliflora brevicuspis

Smaller than the species, more closely matted, the leaves shorter, the lower ones obtuse: the herbaceous part of the branches very short: flowers in numerous small cymes, clustered at the ends of the branches, nearly immersed in the leaves: calyx about 2 mm. long, with a swollen turbinate base: sepals closely valvate, forming a short cylindrical tube closed at the summit by their arched tips, the tip and awn very short.

Not plentiful, but occurring occasionally on open, stony ridges in the hills. No. 349, Laramie Hills, July 7, 1894, well represents this variety.

Paronychia Jamesii T. & G. has sometimes been reported from this range, but it seems probable that most of the specimens so-called belong rather to the following species.

Paronychia diffusa

Allied to *P. Jamesii* but wholly prostrate-spreading: the woody root vertical, the numerous branched stems crowded on its crown: stems widely spreading, their perennial portion buried in the soil, the herbaceous portion short, very leafy: leaves equaling or exceeding the internodes, narrowly linear, mostly acute and mucronate: stipules silvery, lanceolate, shorter than the leaves: influorescence contracted, the numerous small cymes congested at the ends of the short, brittle stems: flowers nearly sessile, exceeding the bracts and most of the leaves: sepals minutely puberulent as are also the leaves and stem, the short turbinate base of the calyx minutely hirsute: cusps short, arched within: filaments short, exceeding the staminodia.

This is the commonest species in this genus in this range. The following numbers well represent it: 451, 1331, 2103 and 2769.

Besides the foregoing *P. pulvinata* Gray occurs on some of the Alpine summits in our mountains.

Draba surculifera

Perennial, root short, bearing on its crown a few to several erect, simple stems and some short leafy stolons: stems slender, strict, 2–3 dm. high, pubescent with scattering, simple hairs and a closer branched puberulence: leaves of the crowns and the stolons

crowded, oblanceolate, short-petioled or nearly sessile, 3–5 cm. long, 5–10 mm. broad, cinereous with a close stellate pubescence or glabrate: upper stem leaves ovate or broadly lanceolate, acuminate, sessile by a broad or partly clasping base, sub-glabrous, downward gradually passing into the basal leaves: fruiting raceme constituting ⅓–½ of the whole length of the stem, naked above, the lower pods in the axils of the upper leaves: flowers yellow, rather small: sepals glabrous or nearly so, ovate: petals obovate, narrowed into a slender claw, nearly twice as long as the sepals: filaments exceeding the sepals, rather stout, anthers small: pod lanceolate, 8–12 mm. long, finely pubescent, usually flat but occasionally twisted: style rather thick, about 1 mm. long: pedicels slightly shorter than the pod: seeds 16–20.

This species may possibly be found in some of the herbaria as one of the forms of the Rocky Mountain aggregate that has been called *D. aurea* Vahl. The true *D. aurea*, if figures and descriptions may be relied upon, has a single stem, corymbosely branched above: *D. surculifera* has several unbranched stems and some short, stoloniferous shoots. Of the several species recently published by Dr. Greene, only two are closely allied to this, viz. *D. Neo-Mexicana* (Pittonia, **4**: 18) which is separated by its stellate-pubescent calyx, its glabrous, elliptical pods and its long style and probably other characters that would appear were that before me: *D. spectabilis*, which is separated from this by its showy flowers and differences of fruit. In some respects, *D. Herleriana* resembles this but its branching stems and narrow twisted pods make it impossible to unite the two.

Type specimen no. 5125, La Plata Mines, Medicine Bow Mts., by Mr. Elias Nelson.

Lesquerella condensata

Perennial, the several branches of the caudex very short and crowded (in loose, sandy soil more open and sheathed by the dead leaf bases), the whole plant both in flower and fruit forming a small, dense, sub-globose tuft, 3–8 cm. in diameter, finely and densely stellate-pubescent throughout: leaves greatly crowded on the crowns, linear or narrowly oblanceolate, 1–4 cm. long: inflorescence a short, corymbose raceme, about equaling (rarely exceeding) the leaves: petals broadly spatulate or with an elliptic blade, 6–7 mm. long, about half exceeding the sepals, the claw broad and margined: filaments slender, equaling the sepals, slightly enlarged at base: pod ovate, compressed at summit, 5

mm. long, about equaling the slender style: ovules two in each cell, usually only one maturing; septum generally perforated by a narrow slit.

Probably most nearly allied to *L. alpina* (Nutt.) S. Wats. which seems to be a very rare plant. From this its compact, tufted, stemless habit separates it, as does also its smaller flowers and short racemes and few-seeded pod.

This is one of the first plants to come into blossom on the Laramie Plains, its bright yellow showing on some of the naked, rocky slopes of the foothills in mid April. It seems to occur in similar situations throughout the southern part of the state. Collected a number of times and, on the determination of others, distributed as *Draba glacialis* Adams., a most unaccountable error. Some of our collection numbers of it are 62, 1218, 3071, 4324 and 4797, the latter number unusually large in every way.

Cerastium Buffumae

Perennial (?), stems densely clustered on the crown of a slender root, closely leafy-matted and spreading, light or yellowish green: the numerous stems spreading or ascending, 7–15 cm. long, minutely glandular-pubescent, the internodes gradually longer upwards and less conspicuously leafy: leaves small, very numerous below, oblong to elliptic, sessile or tapering to a broad, petiole-like base, 5–12 mm. long: inflorescence strict and fascicled, the lower pedicels elongated: pedicels and calyx closely glandular-puberulent: sepals green, barely scarious margined at the tip, oblong, obtusish, 4–5 mm. long: petals one half exceeding the sepals (more or less), bifid: stamens ten: styles five: capsules when mature about twice as long as the sepals: seeds brown when mature, closely but minutely papillate.

In 1892 an extensive collection, mostly of grasses, was made by Professor B. C. Buffum for this University. Mrs. Buffum who accompanied the expedition collected most assiduously in other groups. Among the good things she secured was an abundant supply of this fine species from some locality in the Big Horn Mountains, the exact place not now known. It is with pleasure that I dedicate this species to its discoverer. Type specimen in Herbarium University of Wyoming.

Thermopsis annulocarpa

Perennial from horizontal rootstocks, silvery pubescent throughout with short, soft, appressed hairs: stems single, or two (possibly

more) from the crown of each rhizome, 3–4 dm. high, simple below, branched above, the branches slender, leafy, barren, exceeding the single mature raceme: leaves elliptic, oblong or broadly oblanceolate, mostly obtuse, 3–5 cm. long; stipules broadly ovate or rhombic below, narrower upward, the upper oblong, 2–3 cm. long; petioles about as long as the stipules: raceme strictly terminal on the main axis: calyx-tube campanulate, somewhat nerved at the base, 5 mm. long, the lobes shorter: corolla unknown: mature pods pubescent, 12–15 cm. long, about 7 mm. broad, circularly curved, usually forming a complete ring or the apex even overlapping the base: seeds 7–10; the ovules somewhat more numerous.

That it should be necessary to establish a third species in this genus, from this state within a year, is a little singular but this plant differs so radically that it can not be disposed of satisfactorily in any other manner. In habit and pubescence it suggests *T. argentata* Greene but in fruit character it is nearer *T. rhombifolia* Rich. though its circularly curved pod makes it distinct enough from that. Then too the habitat of this is exceptional. While not strictly alpine yet it is more than sub-alpine. It was secured in the Ferris Mountains, among the rocks on the naked slopes near their summits, at an altitude of fully 10,000 feet.

Type no. 4971, by Mr. Elias Nelson, July 25, 1898.

Anogra rhizomata

Perennial: rhizome horizontal, long, semi-woody, moderately thick, giving rise at intervals to short, obliquely ascending branches: stems several, from the crowns of the branches of the rhizome, divaricate-ascending, 1–2 dm. long, from pinkish to light violet, puberulent: leaves from nearly entire to deeply pinnatifid, linear-oblong in outline, the lower somewhat petioled, 3–5 cm. long, more or less hispid-ciliate and puberulent: flowers axillary, congested at the summit of the stems; buds acute at apex, sometimes glabrate: calyx tips free, lobes shorter than the petals, usually much shorter than the tube, throat not villous: petals white or pink, sub-orbicular: capsule linear, somewhat angled, scarcely tapering to the apex, 2–3 cm. long, divergent or becoming deflexed.

This and *A. albicaulis* resemble each other greatly in general aspect but the remarkable rhizome of the one is to be contrasted with the slender, vertical taproot of the other. The obtuse buds and small, tapering capsule of the larger plant is to

be contrasted with the acute buds and long, prismatic-cylindrical capsules of the smaller, perennial plant.

Cymopterus bulbosus

Root large, clavate, increasing in diameter downward, the end usually bulbous, 10–15 cm. long, 2–4 cm. in diameter in thickest part: caudex very short, covered with the bases of the petioles of dead leaves: leaves 1 or more from the caudex and several on the stems (the former long petioled), glaucous, bipinnate, ovate in outline, 4–7 cm. long; the pinnae also ovate, pinnatifid or toothed, the ultimate segments oblong to ovate, 3–8 mm. long; petioles with expanded membranous base: stems 1–2 from the crown, slender, 3–5 cm. long, giving rise at their summits to several leaves and peduncles: peduncles moderately stout, at maturity 5–10 cm. long and equaling or exceeding the leaves: involucre and involucels of broad membranous bracts with broad greenish midrib, more or less united at base: rays unequal, 8–15 mm. long, those of the aborted umbellets very short; pedicels 5–8 mm. long: fruit elliptic to oval, 8–14 mm. long, 6–10 mm. wide; wings broad and thin, equaling or narrower than the seed body, the dorsal or the two intermediates occasionally not developed: oil tubes mostly 3 in the intervals and 6 on the face, the two middle ones situated near the inner side of the integument: seed face concave.

That this species may exist in the herbaria as *C. montanus* Nutt., is possible but no two related species are more easily discriminated. In *C. montanus* the peduncles are very short, shorter than the leaves in both flower and fruit; the leaf segments are rather distant while in *C. bulbosus* the segments are crowded. The large bulbous termination of the root will further distinguish the latter as do also the thin integument and thin wings (which are scarcely thickened at the base) in contrast with the conspicuously thickened integument and base of the wings of the other. If more points are needed the habitat is also discriminative. *C. montanus* is of the open plains of the Rocky Mountain region in general while the other seems to be confined to naked, clay soil, such as occurs in the ravines and slopes among the Green River shales. Type specimen in Herb. University of Wyoming, no.

4709, June 14, 1898. Also collected in 1897 at Point of Rocks no. 3085.

Pentstemon Utahensis (Wats.)

P. glaber Utahensis Wats. Bot. King, 217.

Dr. Watson placed this as a variety because there were seemingly intermediate forms connecting this with related species. The several authentic specimens of it at hand from various parts of the Rocky Mountains show certainly as much constancy in characters as any of the recognized species. Its tall, strict stems, with long internodes and erect, relatively narrow leaves; its rather crowded, long petioled basal leaves, and its greatly elongated inflorescence puts it in sharp contrast to *P. glaber* Pursh.

Of the more recent collections that well illustrate its characters are Baker, Earle and Tracy's specimens from Mancos, Colo., no. 405 and the writer's nos. 1093, 1559 and 4102, from various parts of Wyoming.

Phacelia campestris

Annual, minutely pubescent, scarcely glandular, branched from the base, the 2–6 main branches decumbently divaricate at base, these more or less branched and with ascending tips, main branches 8–12 cm. long: leaves oblong in outline, 1.5–3 cm. long (including the short petiole), deeply pinnatifid, the 3–5 pairs of segments oblong, obtuse, entire; the terminal lobe usually three-toothed: raceme simple, at first short and crowded, later open, the few flowers (6–12) rather uniformly distributed on the 4–7 cm. long rachis: pedicels very short: sepals oblong or narrowly spatulate, minutely hispid on the margins, in anthesis a third longer than the corolla, lengthening slightly in fruit: corolla white, 2–3 mm. long, short tubular, the rounded lobes $\frac{2}{5}$ of its whole length, appendages very narrow: filaments dilated downward, about the length of the corolla-tube, subequal: style equaling or shorter than the ovary, much shorter than the mature capsule, divided one half its length: capsule finely pubescent, oblong, obtuse, 3–4 mm. long, a little shorter than the sepals: seeds 10–14, elliptic, compressed, transversely ridged.

To be compared with *P. Ivesiana* Torr. from which it differs in being much less glandular, in having a corolla shorter than the calyx, nearly equal stamens and fewer seeds.

It was secured on the open plains, in loose sandy soil about the roots of sage-brush, near Granger, June 14, 1898, no. 4696.

Lappula cenchrusoides

Annual, rather intricately bushy-branched, 2–4 cm. high: stems and branches rather slender: pubesence moderately harsh, rather minute, that of the stems of short, appressed, whitish hairs with inconspicuous pustulate bases,—of the leaves somewhat similar, scanty on the upper face, denser below with inordinately large pustulate bases: leaves numerous, small, oblong to ovate, 1–2 cm. long: flowers in leafy-bracted spikes, very minute: the lobes of the corolla obtuse, suborbicular, slightly shorter than the tube which about equals the calyx: nutlets large, ovate-acute, nearly sessile, not deflexed, minutely papillose-tuberculate on the back, the larger of the tubercles in a median row, armed on the margins with a double row of bristles; bristles glochidiate-barbed at the apex only, somewhat unequal, mostly distinct to the base.

This was found in considerable abundance in a dry cañon, among the rocks, mostly in clumps. The very abundant sandbur-like fruits at once attracted attention and closer examination shows many points of difference between this and *L. Texana* (Scheele) Britt. which is so abundant in this range.

Type specimen in Herb. University of Wyoming, no. 5339, Laramie Hills, September 14, 1898.

Mertensia foliosa

Rootstock vertical, short, thick, covered with dead brown bark, usually branched at summit, the 1–several crowns clothed with the bases of dead petioles: roots slender, fibrous, intermingled with a few large woody ones: stems 1 or more from each crown, simple, ascending or erect, striate, glabrous or minutely pruinose, 2–3 dm. high, leaves thick, ample, glabrous, minutely scabrous on the margins: radical leaves numerous, elliptic to oblong, 4–7 cm. long, slender petioles once or twice as long: cauline crowded, sessile, oblanceolate or (upwardly) lanceolate and acute: the foliar bracts lanceolate: panicle rather crowded, the lower peduncles but little elongated: corolla rather large, about 15 mm. long, the tube slightly exceeding the limb, about twice the length of the lanceolate sepals; the crests in the throat between the bases of the filaments conspicuous, a 10-toothed ring at the base of the tube, glabrous throughout: filaments as broad or broader than the anthers: anthers (in all specimens examined) exserted *i. e.*, outside of the tube.

Recently distributed under no. 2951 as *M. oblongifolia* which it is far from being. It is the prevailing species in southwest

Wyoming on the sage-brush slopes in the foothills. The dense, leafy clumps are both numerous and conspicuous. Observed and collected in several localities, but the before mentioned number from Evanston, May 28, 1897, is designated as typical.

Mertensia viridis

M. lanceolata viridis Aven Nelson, First Rep. Fl. of Wyo. 158.

Rootstocks woody, creeping in the crevices among the rocks; the crowns sheathed by the dead petioles: stems one or more from each crown, glabrous or sparsely hispidulous, decumbent at base, slender and rather weak, 2–4 dm. long: leaves bright green, glabrous below, minutely hispidulous above: radical numerous, 4–6 cm. long, from oblong to elliptic, on slender petioles about twice as long as the blade: cauline oblong, becoming smaller and acutish upward: panicle leafy bracteate, many-flowered: peduncles and pedicels slender, the former surpassing the foliose bracts: corolla about 1 cm. long, the tube exceeding the limb and about twice the length of the sepals: filaments narrower than the anthers.

Since the publication of this plant as a variety of *M. lanceolata* DC. it has been collected once more, this time near Dome Lake at the summit of the Big Horn mountains, no. 2430. These latter plants show that it is a good species. It is strictly alpine. The original collection is no. 1608, Laramie Peak, 1895.

Lithospermum asperum

Perennial: root large, woody, deep-set, the dark bark exfoliating in thin flakes: caudex rather numerously and slender branched, dark brown with scale-like leaves and exfoliating bark: herbaceous stems numerous, slender, rather brittle, simple or branched, 15–25 cm. long, hirsute, the short whitish hairs divaricate: leaves rather numerous, from oblong to linear, the broader tapering to a narrow base, all sessile or nearly so, 2–4 cm. long, rough hirsute, rather sparsely so, especially on the upper surface, the hairs short, tapering from a pustulate base: flowers on short, very hispid pedicels, axillary: sepals linear, about 5 mm. long: corolla yellow, tube long, 2–3 cm., lobes oval, crenulate-erose, about $\frac{1}{4}$ as long as the tube, crests rather small: stamens inserted about $\frac{1}{6}$ the length of the tube below the throat: nutlets as in section Batschia Endl., not impressed-punctate (if at all sparingly and minutely so on the ventral side only).

Having but one collection of this I am unable to state whether it produces more than one form of flowers or not. Since mature

nutlets were secured on the same plants with the conspicuous flowers it seems probable that no cleistogamous ones are produced. That dimorphism, as to the insertion of stamens, probably exists here as in the rest of the section seems likely.

The most nearly allied species is undoubtedly *L. angustifolium* Michx., but in the rather numerous synonomy of that somewhat polymorphous species I find nothing to indicate that the plant now under consideration has ever been included. This will be distinguished at once from that by the harsh pubescence, the root character, the non-punctate nutlets and its habitat. Though collected but once it was observed carefully in its locality where it was abundant: found only on abrupt, shelving slopes of sandstone. Type, no. 4737, Point of Rocks, June 13, 1898.

Castilleia chromosa

Stems usually numerous, clustered on the crown (or crowns) of a woody root, simple or sparingly branched, ascending or erect with somewhat decumbent base, 2–4 dm. long: pubescence of two kinds, a fine puberulence and more or less of whitish, crisped hairs: leaves variable; the lower entire or nearly so, lanceolate to linear, 3–7 cm. long; the upper pinnatifid, consisting of a lanceolate blade proper, 3–5 cm. long, and 2–4 linear to lanceolate, widely divaricate or ascending lobes; the lobes subacute, somewhat paired, the upper pair short, the lower about equaling in length the blade proper: inflorescence at first short and dense, at length more open-spicate, 10–15 cm. long, more densely crisped-hairy than the rest of the plant: bracts somewhat similar to the upper leaves, the lobes less divaricate, about equaling the corolla, from scarlet to yellowish-red: calyx about 20 mm. long, about equally cleft before and behind, the tube about twice as long as the bifid lobes: corolla more or less exserted, sometimes one fourth exceeding the calyx, the galea a little longer than the tube, the lip very short and almost truncate, three narrow plicae extending from its margin nearly one third the length of the tube.

At first I was inclined to think this merely a form of *C. angustifolia* Don. but after careful study of all the material at hand in the light of Mr. Fernald's excellent presentation of this and the allied species * I feel satisfied of the perfect distinctness of *C. chromosa*. I am even inclined to think that *C. angustifolia* will be found to belong to a range considerably to the northwest of this.

* Erythea, 6: 41.

C. chromosa is widely distributed in the desert region of south-central Wyoming and several collections of it show no remarkable variation. The following are some of the collections of it: Leroy, Uinta Co., no. 4577, June 7, 1898; Green River, Sweetwater Co., no. 4721, June 14, 1898; Ft. Steele, Carbon Co., no. 5380, June 18, 1898.

Erigeron pinnatisectus (Gray)

E. compositus pinnatisectus Gray, Proc. Am. Acad., **16**: 90.

To regard this longer as a variety of *E. compositus* is simply to keep up a cumbersome nomenclature that is neither necessary nor justified by the plant. There are sufficient forms that must of necessity be held as varieties of that species, without including a form so decidedly at variance with the others. *E. pinnatisectus* in its comparatively simple root-system; its fewer, glabrate leaves and stems; its pinnately dissected leaves, and its numerous, long, purple rays is strongly in contrast with the tufted, compact habit; the trifid or multifid leaves; the rather conspicuous pubescence, and the white rays of the other.

E. pinnatisectus mostly occurs at higher altitudes than *E. compositus* and consequently is less frequently collected but, nevertheless, it is fairly well represented in the herbaria. Professor C. S. Crandall's specimens from the head waters of Beaver Creek, Colo., and the writer's no. 1816, LaPlata Mines, Medicine Bow Mountains, well illustrate it.

Erigeron melanocephalus

E. uniflorus L. of most American authors, in part; *E. simplex* Greene, Fl. Fran. 387, in part (?); *E. uniflorus melanocephalus* Aven Nelson, First Rep. Fl. Wyo. 131 and 206.

Main root woody, more or less branched, giving rise to numerous fibrous ones: caudex thick and nearly simple or more or less branched, the branches short: stems few to several (often 10 or more), slender, erect, 5–15 cm. high, monocephalous, pubescent with purplish hairs: leaves numerous on the crowns, nearly sessile to long-petioled, blade elliptic to narrowly oblong, 2–5 cm. long (including the petiole), almost glabrous; stem leaves several, broadly linear, acuminate, 2–3 cm. long, pubescence similar to that of the stem: heads large, when fully expanded 3 cm. broad: involucral bracts involved in a dense, dark-purple wool, the hairs of which consist of purple and transparent cells alternately ar-

ranged: rays 50–60, white or barely pinkish: disk flowers very numerous, all of them perfect.

By separating the American forms from the Old World *E. uniflorus*, Dr. Greene has simplified the study of the American species. It seems to me that *E. simplex* is still an aggregate. As characterized by Dr. Greene, "Stem solitary, simple, involucre densely villous-hirsute," the form now proposed as a species is excluded. *E. melanocephalus* shows a constant tendency to a caespitose habit and several stems: its dark, almost black, involucres are strongly in contrast to the light colored ones of *E. simplex*. The fact that the very numerous florets of the disk are all perfect seems also to be in disagreement with *E. simplex*, as it is most frequently described. Both species occur in the Rockies but the latter has the wider range and is, I believe, alpine while *E. melanocephalus* is mostly alpestrine, occurring in the small, grassy parks below or near the timber line. Undoubtedly many of the collections from the Rockies belong to this species. Our numbers, 1772 and 5180 from the LaPlata Mines, Medicine Bow Mountains well illustrate it.

Erigeron Engelmanni

Root single, short, tapering rapidly, woody, more or less branched below: crown woody, from nearly simple to numerously but very short branched: leaves very numerous, crowded on the crowns, linear, on very slender petioles which about equal the blade, closely sub-cinereous, somewhat ciliolate on the petioles, from 2–6 cm. long (including the petioles): stems weak, decumbent or prostrate, moderately leafy, pubescence similar to that of the leaves, 3–6 cm. long, monocephalous or with 2 or 3 heads: peduncles short, ascending, 1 or more bracted: heads rather small, involucre about 5 mm. high, its bracts equal, in two series, narrowly linear, acuminate, dark green with light margins, ciliolate: rays white, broadly linear, 40 (more or less), the ligules about 5 mm. long, equal: achene small, obscurely pubescent.

In looking through the "inquirendi" sheet of *Erigeron* in Herb. Mo. Bot. Garden, I found just one specimen of this plant collected by Dr. Geo. E. Engelmann, June 26, 1880, at Evanston, Wyo. My no. 5389, which I cite as type, is from the same locality, June 19, 1898, and is a perfect duplicate of Engelmann's. The habitat of this species seems to be the stony slopes of the foothills where each plant forms a flat, spreading mat among the stones. Its affinities, I should think, are with *E. Eatoni*.

Erigeron inamoenus

Caespitose, the roots numerous, one or more short tap-roots and many fibrous ones: caudex of few to many short crowded branches: leaves numerous, fascicled on the crowns, linear-spatulate, pubescent with short, stiffish hairs, 2–4 cm. long, including the slender, ciliolate petiole which is nearly twice the length of the blade: stems scapose, pubescent, 5–10 cm. long, the 3–5 basal leaves not apparent as they are concealed by the similar fascicled ones of the crowns, a single bract on the monocephalous peduncles: involucre broad-campanulate, about 6 mm. high, ciliolate-pubescent; bracts linear, acuminate, with a dark green midrib and scarious margins: rays purple, 25 more or less, broadly linear to oblong, the ligule 7–10 mm. long, the tube short: pappus bristles slender, in one series, about equal: achenes pubescent.

A beautiful species with a very characteristic root system and large (for the plant) handsome heads of flowers. Secured but once, when it was found in the greatest profusion, literally carpeting the whole rounded summits of low hills otherwise destitute of vegetation. The soil (?) was a red clay and pebbles as large as birds' eggs, mostly pebbles. Type specimen in Herb. University of Wyoming, no. 4680, Kemerer, June 13, 1898.

Erigeron Wyomingensis

Root nearly simple, woody: caudex multicipal, the branches very short and crowded, covered with dead leaf-bases: stems simple, numerous, one to several from each crown, rather closely pubescent with spreading unequal hairs, leafy below, naked-peduncular above, 7–15 cm. long: leaves crowded on the crowns, short hirsute all over, the margins stongly hirsute-ciliate especially on the petioles, linear-spatulate, on petioles exceeding the blades, 3–5 cm. long (including petiole): stem leaves several, similar but becoming smaller upward: peduncles naked or with a filiform bract, monocephalous: heads large, including the spreading rays 20–25 mm. broad: involucral bracts narrow, in two rows, hirsute, long acuminate, with a dark green midrib, half as long as the rays: rays purple, 40–70, pappus of sparse, slender bristles, equaling the numerous disk corollas and a close ring of short, unequal, paleae-like hairs: achene pubescent, glabrate at maturity, oblong-spatulate, 2–3 mm. long.

This species has much the habit and pubescence of *E. pumilus* Nutt. but its smaller size, simple, less leafy stems, long peduncled heads and purple rays at once distinguish it.

It is also to be compared to *E. condensatus* (Eaton) Greene, under which name some specimens were recently distributed, no. 3088, Point of Rocks, June 1, 1897. That is, however, a plant of a more southwestern range and seems to be a smaller plant, with shorter leaves, more coarsely hirsute, light colored rays and a very different pappus.

E. Wyomingensis I have seen so far from this state only. It occurs rather sparingly in the south-central portion of the state, on dry gravelly hillsides. Collected in 1898 also. Type in Herb. University of Wyoming, no. 3088.

WYOMINGIA

Perennials with woody, more or less branched roots and short, woody, caespitose, multicipital caudices whose branches are roughened or sheathed by the bases of the leaves of the previous years: stems simple, monocephalous, one or more from each crown, becoming naked and pedunculate above: leaves crowded on the crowns and on the bases of the stems: heads large, involucral bracts in 3–4 successively shorter rows, rigid with a thickened midrib: flowers Aster-like, rays broad, comparatively few, disk-flowers numerous: style appendages short, triangular-cuspidate: achenes short, densely pubescent, subterete.

Wyomingia pulcherrima (Heller)

Erigeron pulcherrimus Heller, Bull. Torr. Bot. Club, **25**: 200, *pl. 304.*

Mr. Heller's plant as the first published of the species upon which the genus now proposed as new is founded, may stand first. His species and the one collected by the writer (described below) are, so far as known at present, the only members of the genus. It may turn out, however, that with these are to be associated one or two others among which may be named *Erigeron Montanensis* Rydb.

The generic description is drawn in particular from the following species, though an examination of Mr. Heller's plant leaves no doubt whatever that the two are closely congeneric. To place these plants in the already diverse genus *Erigeron* would be very unsatisfactory as the characters show.

The root and caudex systems are those of *Xylorrhiza* and the broad rays also suggest that genus. *Wyomingia* is further to be dis-

tinguished from *Erigeron* by its multiserial involucre and the thickened rigid bracts; by the short, strongly pubescent achenes, which are scarcely flattened, and by its uniserial pappus. I had thought to call the genus *Helleria* in honor of that indefatigable collector, A. A. Heller, but that name being preoccupied I call it *Wyomingia* in honor of my own state.

Wyomingia cinerea

Characters of the genus: stems erect, fascicled, somewhat striate with yellowish-green lines (possibly a generic distinction), about 2 dm. high, the upper part naked, pedunculate, usually with a single bract: leaves linear or some of the crown leaves spatulate, acute, cinereous (as are also the stems) with a short, close, appressed pubescence: heads large, when fully open, 3 cm. or more across: involucre broadly hemispherical, about 1 cm. high, its bracts acute, cinereous with a spreading, crinkled pubescence; rays 30 (more or less), 5–7-nerved, white or pinkish, the tube finely pubescent as are also the disk florets, 3 mm. broad, 3-toothed at the rounded apex: pappus tawny, in a single series, about as long as the disk corollas, the bristles mostly abruptly flexed ⅓ their length below the apex: achene short, striately marked with 2–4 greenish-yellow lines, densely pubescent: receptacle flat, alveolate.

A handsome species and certainly rare. Collected on sterile, gravelly hillsides in the Platte River bluffs, near Ft. Steele, June 18, 1898, no. 4828. Very similar and probably the same as this is Professor C. S. Crandall's specimens from Grand Junction, Colo., distributed as *Erigeron argentatus* Gray. Type in Herb. University of Wyoming.

Elliot C. Howe, 1828–1899

By Charles H. Peck

Elliot C. Howe was born at Jamaica, Vermont, February 14, 1828. Coming to New York in early life he received his academic education in the academies of Troy and Lansingburg. Early in life he gave indications of a love for natural science and turned his attention to the study of geology, zoölogy and botany. Music also received a share of his attention and pharmacy had attractions for him. This soon led him to the broader field of physiology and medicine. He engaged in the study of medicine in New York City and while there did literary and reportorial work for the New York *Tribune*, then under the management of its celebrated editor, Horace Greeley. After receiving the degree M.D. he returned to Troy and commenced the practice of medicine. Here he remained three years, giving in that time such attention as he could to music and botany. He was leader of the choir of the Fifth Avenue Methodist Church until he was induced to leave Troy and enter the large and flourishing Charlotteville seminary as teacher of music, physiology and botany. Charlotteville swamp was in the vicinity of the seminary and it was soon made famous by his discovery in it of the beautiful American Jacob's ladder, *Polemonium Van Bruntiae* Britton. This is the first known New York locality for this plant which then was thought to be the same as the European *Polemonium coeruleum* L. The continuation of this school was abruptly terminated by the accidental burning of the seminary building. Dr. Howe then accepted a position in the Fort Edward Institute, where he taught music, botany and German. Here he became acquainted with Miss Emily Z. Sloan who was also a teacher in the institute and who afterward became his wife. While here he made many friends and engaged vigorously in the study of mosses. He also began the study of mycology and entered into correspondence with the late Rev. M. A. Curtis, of North Carolina, who at that time was the chief devotee and exponent of American mycology. Dr. Howe was the first

New York botanist to take up this study with earnest activity. After seven years he left Fort Edward and renewed the practice of medicine at New Baltimore, N. Y., but the field here was limited and he soon went to Yonkers, N. Y., where he took a prominent position in his profession. He was secretary of the Westchester County Homoeopathic Society for six years and its president for two years. While here he was able to make large additions to his herbarium and to make many new botanical acquaintances. He also became a member of the Torrey Botanical Club. After thirteen years of great activity in Yonkers, failing health, long resisted, compelled him to relinquish the practice of medicine, and fourteen years ago he removed to Lansingburg. As long as his health and strength permitted he found enjoyment in his botanical excursions and in the study of the local flora.

Seven years ago he lost the use of his limbs, and since that time he had been confined to the house a helpless invalid. All these years of affliction he found comfort in his family, a wife and four children, two sons and two daughters, and in his herbarium. He kept up his botanical correspondence and exchanges even to the last month of his life. On the evening of March 2d he fell asleep and a varied and useful life was closed.

He was the author of several pieces of musical composition, among which are "Minnie Moore," his favorite; "The old Arm Chair," "His pleasant Grave," "The dying Drummer Boy" and "The Wanderer's Dream," a piece which was played by the musicians of both armies during the Civil War. He was a correspondent of the Troy *Times* and at one time the editor of the *Family Journal*. In an article in the *Botanical Gazette*, February, 1881, he claimed the hybrid character of *Carex Sullivantii* Boott, which character is now generally admitted. In 1894, in connection with Dr. H. C. Gordinier, of Troy, he published the Flora of Rensselaer county, a Record of the Phenogams and Vascular Cryptogams growing in the county independent of cultivation. In it they record 1345 species and varieties. He wrote the descriptive article on the New York species of *Carex*, published in the 48th State Museum Report. In this he describes a new species, *Carex seorsa* Howe, and two new varieties, *C. lenticularis merens* Howe and *C. Emmonsii distincta* Howe. This article rep-

resents much patient and painstaking labor on the part of its author, who gives very full and detailed measurements of different parts of the plant in each species. It shows what can be done by a man of firm purpose and in love with his work, even when hampered by conditions that would generally be considered sufficient to incapacitate any one for all work. He was the author of several species of fungi, among which are *Tricholoma Peckii*, *Hygrophorus Peckianus*, *Puccinia curtipes*, *P. Peckianus*, *Microsphaera menispermi*, *M. platani* and *M. symphoricarpi*.

He was a correspondent of Professors Gray, Wood, Lesquereux, Dr. Vasey and many other prominent botanists of their day. He was also a correspondent of several European botanists of note. While at Fort Edward he directed the attention of the writer to the interesting features of mycology and induced him to enter this field of botanical investigation, which at that time was almost a *terra incognita* in this country. This was the beginning of a friendship that our botanical excursions, our correspondence, and personal intercourse have served to make stronger and stronger. He was diffident to a fault, strongly sympathetic with the suffering, generous and honorable in his dealings with all and preëminent in his profession for the correctness of his diagnoses of disease.

He has contributed many specimens to the state herbarium. These fine examples of flowering plants, mosses and fungi will continue silently, but effectively, to bear witness to his activity in collecting, his care and neatness in preparing, and his generosity in giving specimens of plants in the study of which he took so much pleasure. His name is fittingly commemorated by two fungi, *Stropharia Howeana* Pk. and *Hypoxylon Howeanum* Pk.

A new Cantharellus from Maine

By Lucien M. Underwood

Cantharellus multiplex

Cespitose-multiplex from a compact base which is nearly black when dry ; pilei more or less flabellate, compound, 3–5 cm. wide, nearly as long, blackish above in drying, cinereous beneath and concolorous to the base of the stipe where it joins the blackish base ; stipe 2–4 cm. long, often deeply grooved above by the decurrent margins of the pileus, occasionally somewhat tubular by their union along the outer edges ; hymenium radiately venulose-reticulate with irregular cross veinlets and frequent minute slit-like fissures and larger irregular depressions ; spores copious, 5–6 μ in diameter often appearing coarsely lobed when freshly moistened as though formed of united granules.

On the ground in dense woods of spruce and fir, Seal Harbor, Mt. Desert, Maine, August, 1898.

Cantharellus multiplex sp. nov., about one-fourth natural size.

The above description was taken from dried specimens which were sent me by Mrs. Elizabeth W. Woodworth, of White Plains, New York, who has also furnished the photograph from which the half-tone illustration was prepared. Mrs. Woodworth furnishes also the following data with reference to the plant in a fresh condition : " Growing in a large irregular mass and weighing from one to three pounds. * * * The color of the fresh pileus was dull purple or purplish lead color, the flesh was decidedly

purple, tender and brittle ; spores white or whitish, very abundant, dusting the entire plant ; height six to twelve inches ; taste mild, odor aromatic. The plant suggested to me curly cabbage. * * * every curly edge having a silvery line, perhaps from the light colored spores ; * * * the leaf-like divisions are about a quarter of an inch in thickness, thinning out toward the edge. It breaks very easily when fresh. It is very rare in the Maine woods. I have found it for two years in the same place—two plants each year. * * * It grew on dry bare ground (possibly from decayed wood beneath) in dense second growth woods of spruce and fir."

The plant is a remarkable one and from its habit might well form a distinct genus since it has little in common with *Cantharellus* except its fold-like gills. It will perhaps be safer for the present to leave it in its present position.

New Plants from Colorado

By George E. Osterhout

Potentilla rupincola

Perennial from a branching caudex 2–3 dm. high, rather slender and paniculately branched, glabrous except for a few stiff, pointed hairs, and woolly pubescence at the base of the calyx and beneath it: the outer stems declined at base: numerous root leaves crowning the rootstock, 6–10 cm. long, slender-petioled, interruptedly pinnate with 5 to 7 leaflets which are narrowly cuneate, incised above with pointed teeth, glabrous except for a few stiff, pointed hairs on the midrib and margins: terminal leaflet petiolulate, the two adjacent lateral leaflets somewhat decurrent on the rachis: stem leaves reduced in size and number upward: stipules lanceolate: cyme diffusely and paniculately branched: the calyx about 5 mm. long, the lobes woolly at base and acuminate, the linear bractlets but little more than half their length: petals yellow, very broadly obovate and retuse, about the length of the calyx lobes: stamens about 18–20: pistils about 6: achene glabrous but imbedded in the wool of the receptacle, somewhat ovate, the upper end turned inward: the filiform style longer than the achene, attached to the under side of the incurved end.

This *Potentilla* belongs to the Leucophylla group as defined by Dr. Rydberg and is nearest to *P. effusa* Dougl. having much the same slender branching cyme and slender acuminate calyx lobes, but is readily distinguished from other members of the group by its glabrous character, and bright green crisp leaves. The specimens from which the description is drawn were collected at Dale Creek in Larimer Co., Colorado, July 20, 1898, where it grows in crevices of the high cliff on the east side of the creek and in seams of the outcropping rock on the west side. It was collected also in the cañon of the upper Cache La Poudre in August, 1893.

I wish to express my obligation to Dr. Rydberg's Monograph of the Potentilleae which makes a study of our *Potentillae* possible, and to Dr. Rydberg himself for the examination of specimens.

Astragalus Hypoglottis bracteatus

A slender usually branching perennial, from slender creeping rootstocks: stem about 2 dm. high, upright and slightly pubescent,

a stout peduncle terminating the stem or branch and ending in an oblong head of white flowers: flowers upright, 2 cm. long, subtended by conspicuous, spatulate, green bracts: calyx pubescent with white hairs, 6–7 mm. long, the slender linear teeth of the same length: lower stipules small, sheathing the stem, the upper foliaceous and about 1 cm. long. The leaves and fruit are similar to the *Astragalus Hypoglottis* L. of our Manuals and Floras.

The variety is readily distinguished from the typical form by the white flowers and spatulate green bracts, even fruiting specimens being readily recognized by the latter. It is described from specimens collected in July, 1896, and again in 1898 along the Laramie river in Wyoming, about one half mile north of Colorado. It is referred to in Prof. Aven Nelson's First Report on the Flora of Wyoming under *Astragalus Hypoglottis* L. as "specimens with ochroleucous flowers" no. 775. Prof. Nelson has also collected it at other stations in Wyoming.

NEW WINDSOR, COLORADO.

Proceedings of the Club

JANUARY 10, 1899, ANNUAL MEETING

Vice-President Rusby presided; 15 present.

Nineteen new members were elected, as follows:

Mr. Wm. E. Dodge, 11 Cliff Street.

Mr. Walter S. Logan, 27 William Street.

Professor Henry F. Osborn, Am. Mus. Nat. Hist.

Mr. James B. Ford, 507 Fifth Avenue.

Leon Labonde, M.D., Ph.D., 174 Lincoln Ave., Newark, N. J.

Dr. Ludwig H. Reuter, Merck Building.

Very Rev. E. A. Hoffman, D.D., Chelsea Square.

Rev. Haslett McKim, 33 West 20th Street.

Mr. Samuel Sloan, 26 Exchange Place.

Mr. Frederick H. Comstock, 119 West 86th Street.

Mr. John T. Willets, 303 Pearl Street.

Mr. Samuel Thorne, 43 Cedar Street.

Miss Margaret F. Jaggers, 18 West 58th Street.

The above were nominated by Dr. Rusby, Chairman Committee on membership.

Also, Mrs. Horace See, 50 West 9th Street, by the secretary.

Ex-Chief Justice Charles P. Daly, 84 Clinton Place, by Dr. Britton.

Mr. Joseph Epes Brown, 123 Remsen St., Brooklyn, New York, by Dr. Rusby.

Mr. Joseph J. Arnaud, 409 East 78th St., by Frederick Ehrenberg.

Mr. John Trumbull Marshall, 205 West 106th St., Summer address Metuchen, New Jersey, by Dr. Underwood.

Professor Geo. Macloskie, Ph.D., University, Princeton, New Jersey, by Professor Lloyd.

One resignation was made and accepted, that of Mr. Benjamin Heritage, Michleton, N. J.

The second order of business was the presentation of annual reports of the officers and of the standing committees, in the following order:

Reports of the Treasurer, Recording Secretary, Corresponding Secretary, Editor, Curator and Librarian.

Reports of the Committees on Admissions, on Finance, on Herbarium, on Phanerogamic Local Flora, on Cryptogamic Local Flora, on Field Excursions, on Program and on Membership.

The Treasurer, Mr. Delafield, reported the Buchanan fund unchanged, and a balance of $44.48 on hand in the general fund.

The Recording Secretary, Professor Burgess, reported an average attendance of 39 at the 15 meetings held during the year, one death, a present active membership of 193, corresponding membership 140, honorary membership 3, total 336. The 27 scientific papers presented include 20 authors, among those nonresident being Dr. Radlkofer, of Munich, and Casimir De Candolle. About 30 new species have been described. Among the papers six related to cryptogams, two were on the nucleus, two were accompanied by lantern views and two by exhibitions of photographs; six were followed by symposia for which general discussions had been prepared. Special reports of collections and of botanical progress numbered 42. Two collations had marked the year's history, one tendered to the Club on March 8th, by the Teachers College, and one tendered by the Club to visiting botanists, especially to members of the Society of Plant Morphology, at Columbia University, December 29th.

The editor, Prof. Underwood, reported the regular monthly issue of the BULLETIN, including 640 pages and 29 plates, with a balance to the credit of the BULLETIN. Slight changes in the BULLETIN include the introduction of author and subject headlines, the arrangement of matter to begin each new article with a new page, and the use of improved plates. By discontinuing book reviews and miscellaneous notes, more space has been gained for articles. The number of pages is itself fifty in excess of those of the preceding year. New numbers of the Memoirs are in preparation. An endowment fund is greatly desired, by which secure provision may be made for prompt publication and superior illustration of American botanical researches.

The report of the Field Committee, through its Chairman, Mr. W. A. Bastedo, enumerated thirty-six field meetings, all held in coöperation with the Brooklyn Institute; three of these were

three-day excursions in coöperation with the Philadelphia botanists, viz., Decoration Day to Point Pleasant, N. J., the Fourth of July to Stroudsburg, Pa., and Labor Day to Whitings, N. J.

In behalf of the Committee on Local Phanerogamic Flora, Dr. Britton referred to the work hitherto accomplished, as represented in Dr. Torrey's catalogue of 1819, and the two preliminary catalogues already published by this Club, by Mr. W. H. Leggett in 1875–6, and by Britton, Sterns and Poggenburg in 1888. Local catalogues within our range include those of Suffolk County, L. I., by Miller and Young, of Staten Island, by Dr. Hollick and others, of New Jersey by Dr. Britton, Dr. Rusby and others, of Long Island by Dr. Jelliffe. Special commendation should be given to Mr. Bicknell's work on the Westchester county flora. It was suggested that the new committee continue and combine the researches contributary to the ultimate publication of a comprehensive Flora of the Metropolitan District, adding such details as possible as to ecological features and quantitative characters of the floral covering.

In behalf of the Committee on Local Cryptogamic Flora, Mrs. E. G. Britton reported the continuance of work on mosses and other groups. A catalogue of the Mosses of the Botanical Garden at Bronx Park is about to be published in its annual report.

The third order of business was the annual election of officers, resulting in the reëlection of those of the previous year.

The fourth order of business was the presentation of miscellaneous notes and brief reports of scientific progress.

Dr. Britton read a letter which he had received that morning from Mr. A. A. Heller from Ponce, Porto Rico, announcing his arrival in health. He observed many interesting plants, as crotons, in the vicinity of Ponce. Mr. Henshaw is about to join him, for further collections, particularly of living material for the Botanical Garden.

Dr. Britton also reported the formal breaking of the ground on January 3d for the range of Horticultural houses for the Botanical Garden, which it is hoped may be ready for installation in October.

Dr. Rusby reported his possession of a Manuscript catalogue of the economic plants of Cuba and Porto Rico, giving the botanic

names, uses, and common names, in about eight volumes of 200 pages each. This is the work of our corresponding member Professor De la Maza, of the University of Havana, who, although but a young man, has formed a large collection of plants there, comparing them carefully with the Charles Wright collection of Cuban plants, a set of which is in the University of Havana.

Recommendations made by the Editorial Board toward the securing of an endowment fund and an enlarged subscription list were approved and referred back to the editors with power.

WEDNESDAY EVENING, JAN. 25, 1899.

President Brown in the chair; present, 20.

The paper of the evening was by Dr. N. L. Britton, entitled, "Report on the progress of the N. Y. Botanical Garden; with photographs."

Dr. Britton said that during 1898 the species cultivated in the Garden at Bronx Park have reached 2110, a gain of 709 on the previous year. The fruticetum, on the plain northeast of the Museum building, was begun in October, and now includes 195 species. The arboretum has been increased to 178 species, including those native to the tract. A viticetum is in preparation, to be planted this spring, including rock-ledges and a rustic arbor about 600 feet long, now nearly completed. An additional nursery space near the southern corner of the tract was prepared last spring, and planted partly with Siberian cuttings. Border screens are now planted around the entire tract except to the south. A complete record of all plants grown is kept by means of a card catalogue. From every plant which flowers on the grounds an herbarium specimen is made; and these are classified in a special herbarium, useful already in satisfying inquiries. The use of the greenhouse on the Columbia University grounds at Morningside Heights was granted in 1896 and is still very important to the Garden. This is the old greenhouse built 1857 by Mr. S. Henshaw for the Bloomingdale Asylum, and is one of the oldest greenhouses still standing in the United States.

Progress on the Museum building has been active, and it is thought it will be ready to occupy by midsummer. The Power House is nearly ready to put into operation. A subway from this

to the Museum is under construction. A stable, toolhouse, etc., have been built. The range of Horticultural Houses is planned to contain thirteen rooms; the contract for seven of these has been signed and ground was formally broken for them on January 3, 1899. Important work has been done toward improving the drainage of the Herbaceous Grounds, and considerable grading and the terraces about the Museum have been begun. The Lorillard Mansion is now used as a police station house, occupied by more than sixty-five officers, making a new and wholesome water supply necessary.

The Museum is planned to provide in the basement a lecture-room seating 900; on the first floor a collection of plant-products, with models and photographs: on the second, a scientific collection including a mounted collection of the local flora on swinging panels; followed by herbarium and laboratories on the top floor.

The herbarium already includes 30,000 specimens besides the Ellis collection. Through the liberality of Mr. Cornelius Vanderbilt, Mr. and Mrs. A. A. Heller are now making collections in Porto Rico. Messrs. P. A. Rydberg and Ernest Bessey made collections in 1897 in Montana, through the liberality of Mr. W. E. Dodge. The results will soon appear as a Flora of Montana, forming the first volume of the Memoirs of the New York Botanical Garden.

In discussion following it was stated that the deciduous trees planted are mainly on the east side of the Bronx River, about 5 of each species, allowing for survival of 2, 3 or 4, besides increased numbers of very rare trees and numerous trees planted for ornament. The stages of the bog-gardens will supply opportunity for comparative study of sub-aquatics by planting different examples of a species in varying conditions of moisture. The Bronx River has recently been occupying three different shallow channels, which would overflow when slightly obstructed. As a result, in April, 1898, there was four inches of water standing in certain low grounds of the north meadow for parts of two days. Since then the main channel has been deepened 18 inches, and the others closed by a stone dam. This may prevent a recurrence. In its 75 to 90 feet head of water-pressure, the Bronx Park Botanical Garden is very fortunate; that at Kew has to pump its water to a water-tower.

Adjournment followed.

TUESDAY EVENING, FEBRUARY 26, 1899

Dr. Rusby in the chair. 30 present.

Prof. F. E. Lloyd, secretary pro tem.

Prof. L. M. Underwood presented a paper on "Species confused under *Aspidium juglandifolium*," discussing the characters and geographical distribution of the forms regarded by him as distinct species, eight in all, constituting the whole number attributed to the genus *Phanerophlebia*. He remarked in concluding that it would be unsafe to describe new species without consulting the valuable collections of ferns in Europe, and especially at Kew. The paper appears in this number of the BULLETIN.

Miss Alice Lounsberry then exhibited the valuable collections of flower paintings by Mrs. Ellis Rowan, which constitute the originals of the colored plates in Miss Lounsberry's forthcoming work, "How to know the wild flowers." Selections which showed the character of the book were read, including the Introduction, written by Dr. Britton, and the Preface, which pointed out the fact that the distribution of plants according to soil was made the keynote of the work.

Dr. Britton said that the book was interesting to him on two accounts, from the ecological basis of classification and the remarkable reproduction in color.

In the absence of Mrs. Annie Morrill Smith, of Brooklyn, Mrs. E. G. Britton read for her the manuscript of a paper, entitled "The flora of the Adirondack Mountain Club area."

Dr. Britton submitted a report of the Committee on "Material for Nature Study in the Public Schools of New York City." The report was adopted without discussion, and is as follows:

"To The Torrey Botanical Club:

"Your Committee, appointed to draft a statement relative to material for Nature Study in the Public Schools of New York City, for transmittal to the President of the Board of Education after approval by the Club, would respectfully report the following preamble and resolutions:

"WHEREAS: The observation and study of natural objects is the primary source of all knowledge, tends to broaden the mind, to quicken the perception, to develop habits of serious thought, to give pleasure and to excite interest,

"*Resolved:* That it is the opinion of this society that if the Public Schools of this City can be regularly supplied with specimens of living plants and animals, and with cabinets of minerals, rocks, shells and other natural objects judiciously selected, and the children be properly taught to observe and study them, a most important educational feature will be added to the present courses of instruction,

"*Resolved:* That the Honorable President of the Board of Education be and is hereby earnestly requested to take this suggestion into consideration for such action as he may deem desirable.

"Respectfully submitted,

"N. L. BRITTON,
"MARIE L. SANIAL,
"H. H. RUSBY,
"Committee."

Dr. Rusby read a letter from Miss Luella Agnes Owen, 306 North 9th Street, St. Joseph, Mo., expressing her interest in the Club, and enclosing a check for $10.00 to be added to its funds.

On motion of Dr. Britton, the sum ($10.00) was made a nucleus of a publication fund.

Dr. Britton stated that 3 boxes of plants had arrived from Mr. H. H. Smith, from the Santa Marta region, New Granada.

Twelve new members were elected, on the nomination of Dr. H. H. Rusby as Chairman of Membership Committee, viz.:

Paton, Wm. Agnew, room 32, 7 Nassau Street.
Pryor, Charles, New Rochelle, N. Y.
Sackett, Henry W., Tribune Building.
Blodgett, Mrs. Wm. T., 24 West 12th Street.
Fellowes, Frank Wayland, New Haven, Ct.
Marc, Theophilus H., 359 Produce Exchange.
Emerson, Miss Julia T., 81 Madison Ave.
Watson, Rev. J. Henry, 355 West 20th Street.
Chamberlain, Rev. L. T., 222 West 23d Street.
Hinton, M. H., M.D., 41 West 32d Street.
Sturgis, Miss F. K., 3 West 36th Street.
Volney, C. W., 173 West 81st Street.

TUESDAY EVENING, MARCH 14, 1899

President Brown in the chair; 27 were present.

Five resignations were read and accepted.

The Secretary laid before the Society the announcement of the annual grant for the encouragement of research given from the Newberry fund, and open this year to work in botany or in zoölogy.

The paper of the evening by Mrs. Caroline A. Creevy, on "Plant Juices and their Commercial Values," described the secretions, oils, gums, resins and other products of plants, with exhibition of numerous specimens. Juices of value are most largely developed in the tropics. The history and present condition of the India-rubber industry was discussed, and that of gutta percha.

Dr. Underwood exhibited a series of photographs of the Fleshy Fungi by Mr. J. A. Anderson, of Lambertville, N. J., colored from the living specimens by his daughter, Miss H. C. Anderson. They illustrate a new process for preserving illustrations of fleshy fungi.

Dr. Britton reported a brief communication from Mr. A. A. Heller, sent from Porto Rico, February 18th, reporting collections made about Ponce, Ibonito, Coamo, etc., now reaching 564 numbers after six weeks' work. On the north side of the island many species occur on the shore which are montane species when growing on the south side.

Dr. Britton also read from a letter of February 26th, just received from Mr. S. Henshaw, from San Juan, describing the sugar plantations, now in the midst of cutting and boiling. He finds the flora not so varied as in Trinidad; the woods are few; in 100 miles he did not see a single large tree.

EDWARD S. BURGESS,
Secretary.

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Cowan, F. H. *Rhododendron maximum* in Somerset County, Maine. Rhodora, **1**: 55. Mr. 1899.

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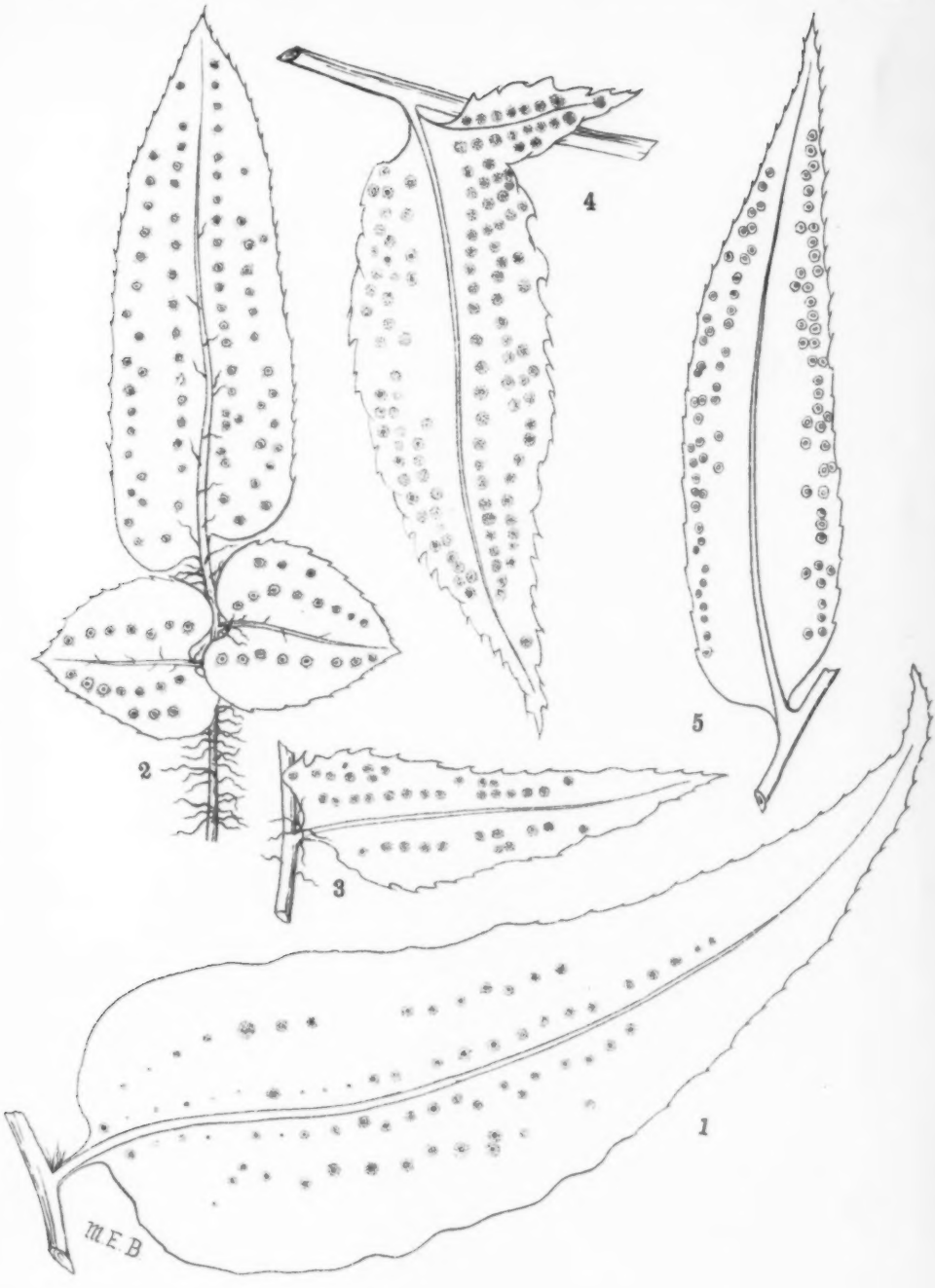

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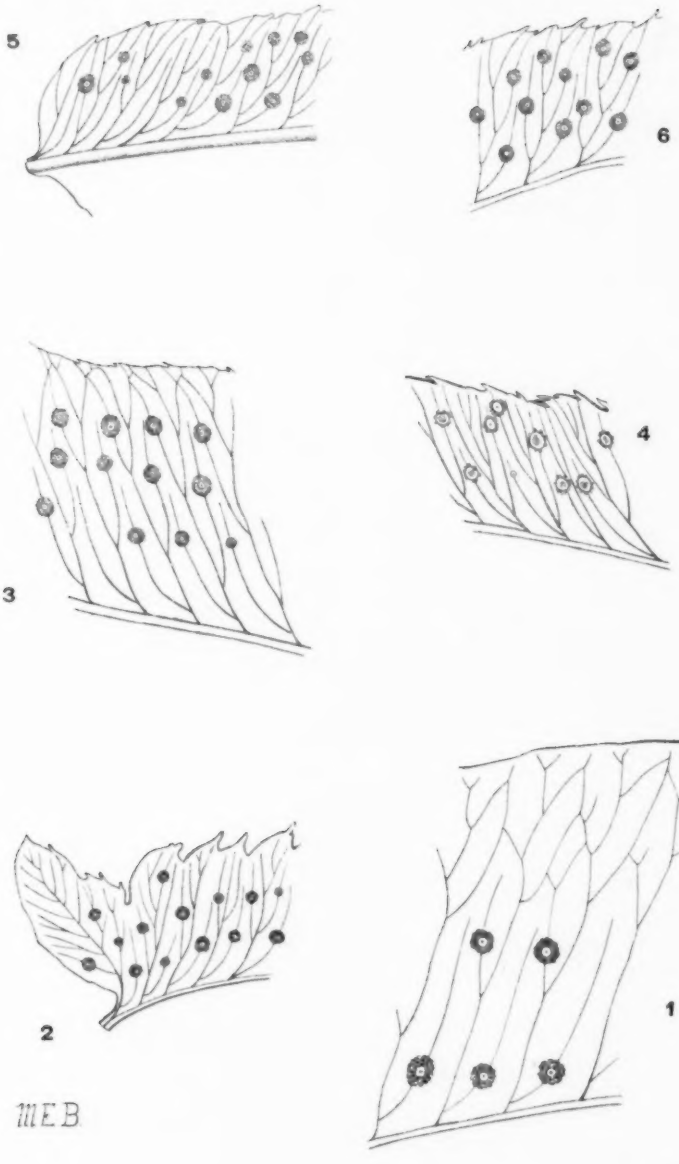

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